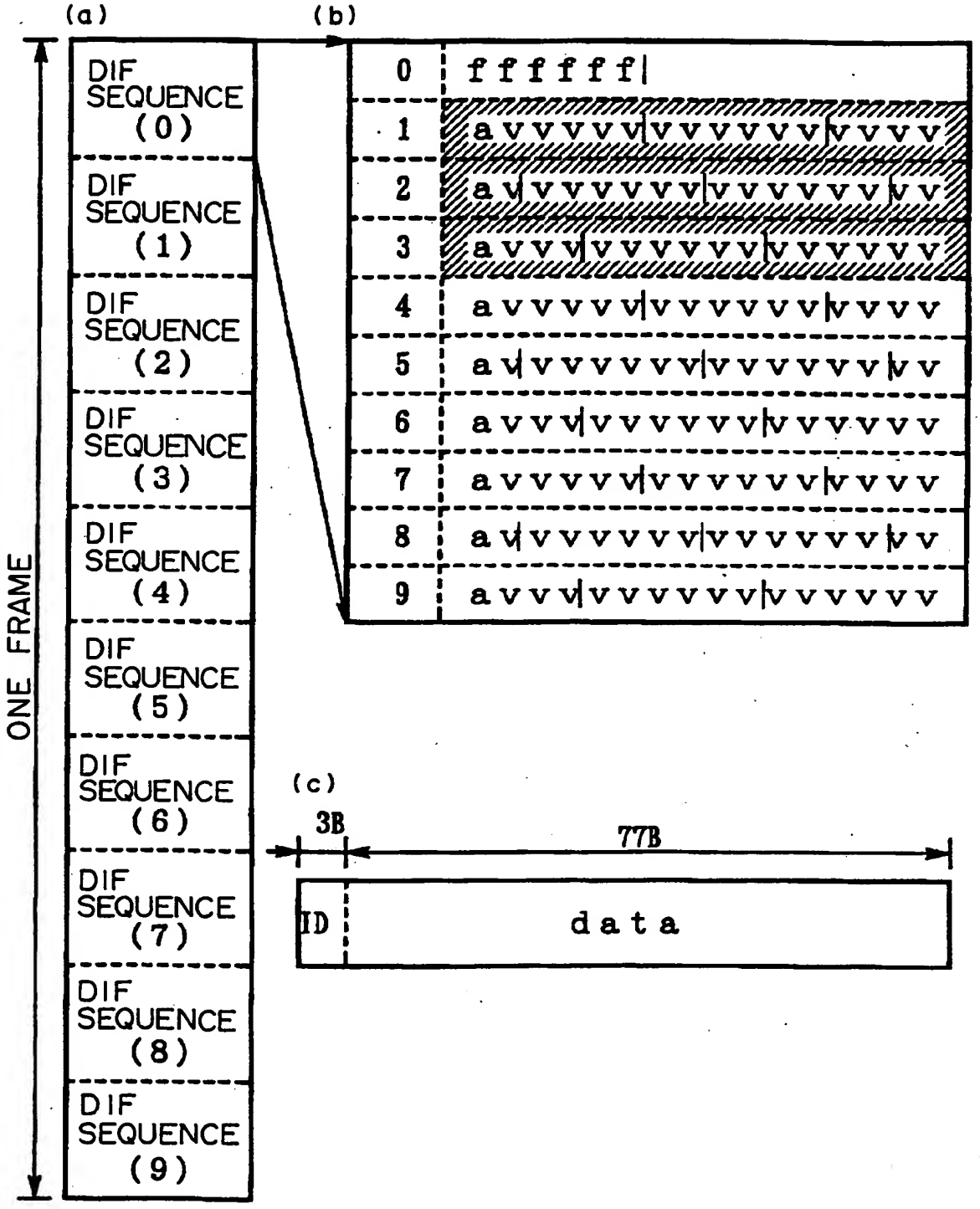


FIG. 1 PRIOR ART

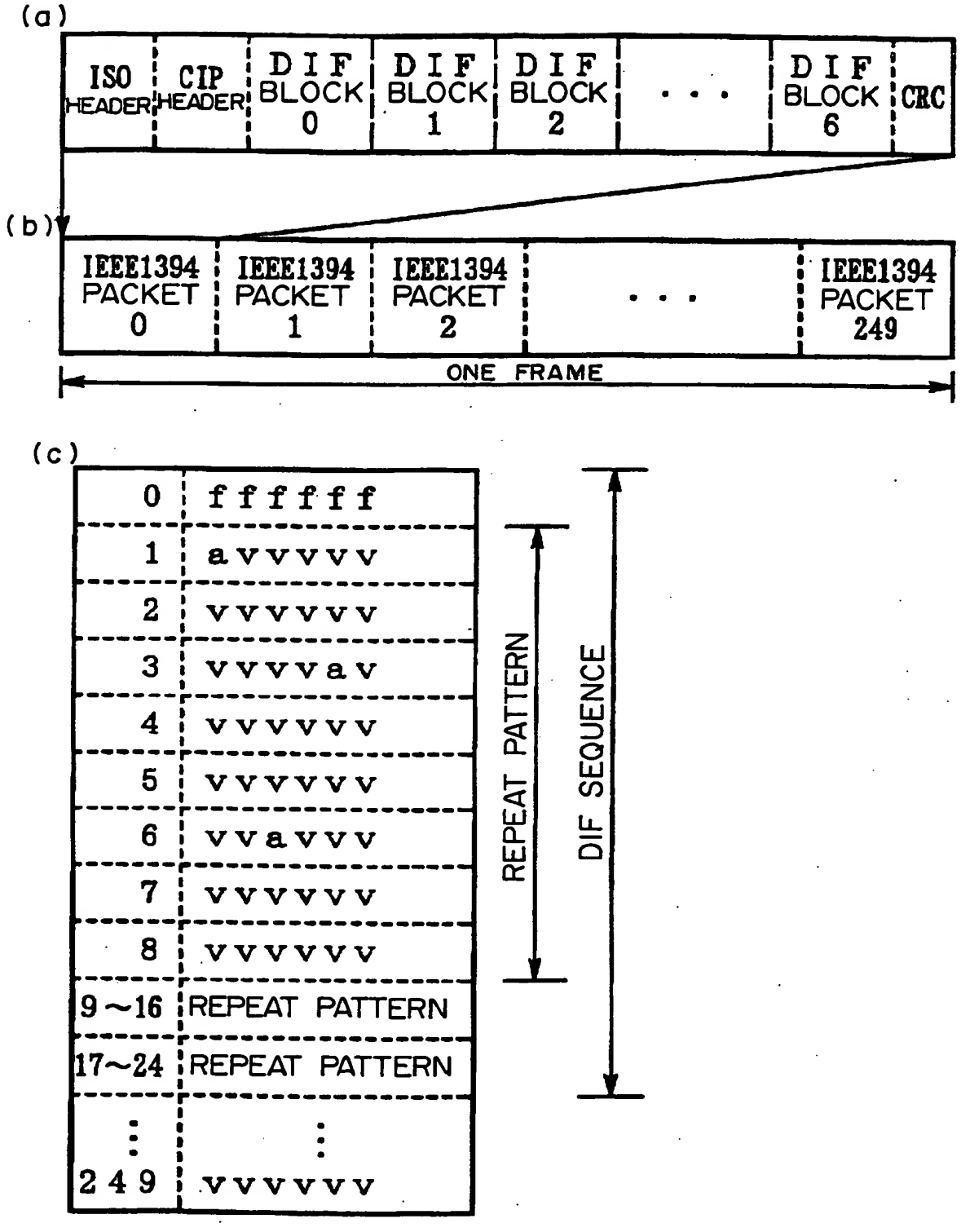


FIG. 2 PRIOR ART

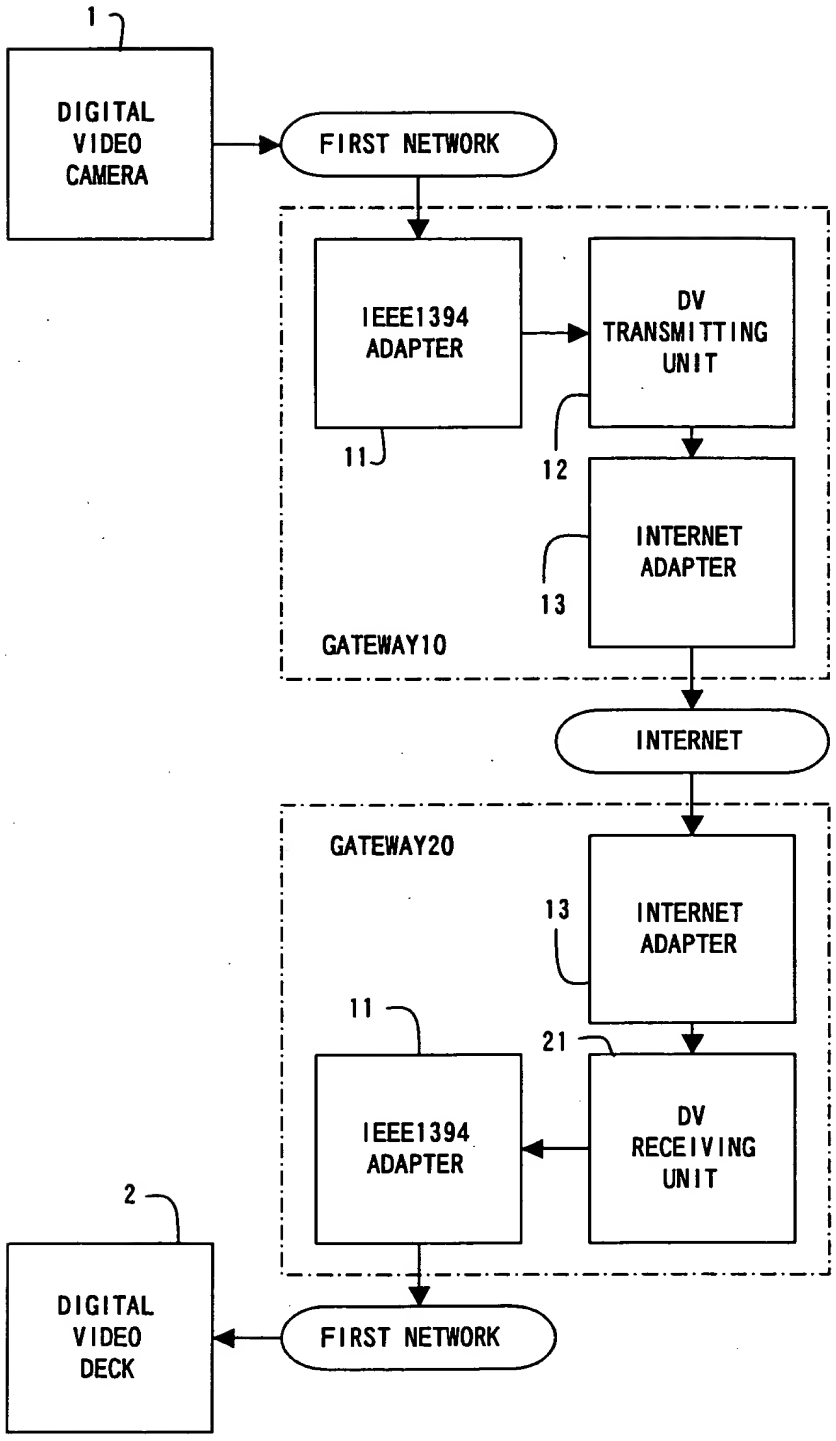

1
DIGITAL VIDEO CAMERA
FIRST NETWORK
IEEE1394 ADAPTER
DV TRANSMITTING UNIT
11
12
INTERNET ADAPTER
13
GATEWAY10
INTERNET
GATEWAY20
13
INTERNET ADAPTER
11
21
IEEE1394 ADAPTER
DV RECEIVING UNIT
2
DIGITAL VIDEO DECK
FIRST NETWORK

FIG. 3

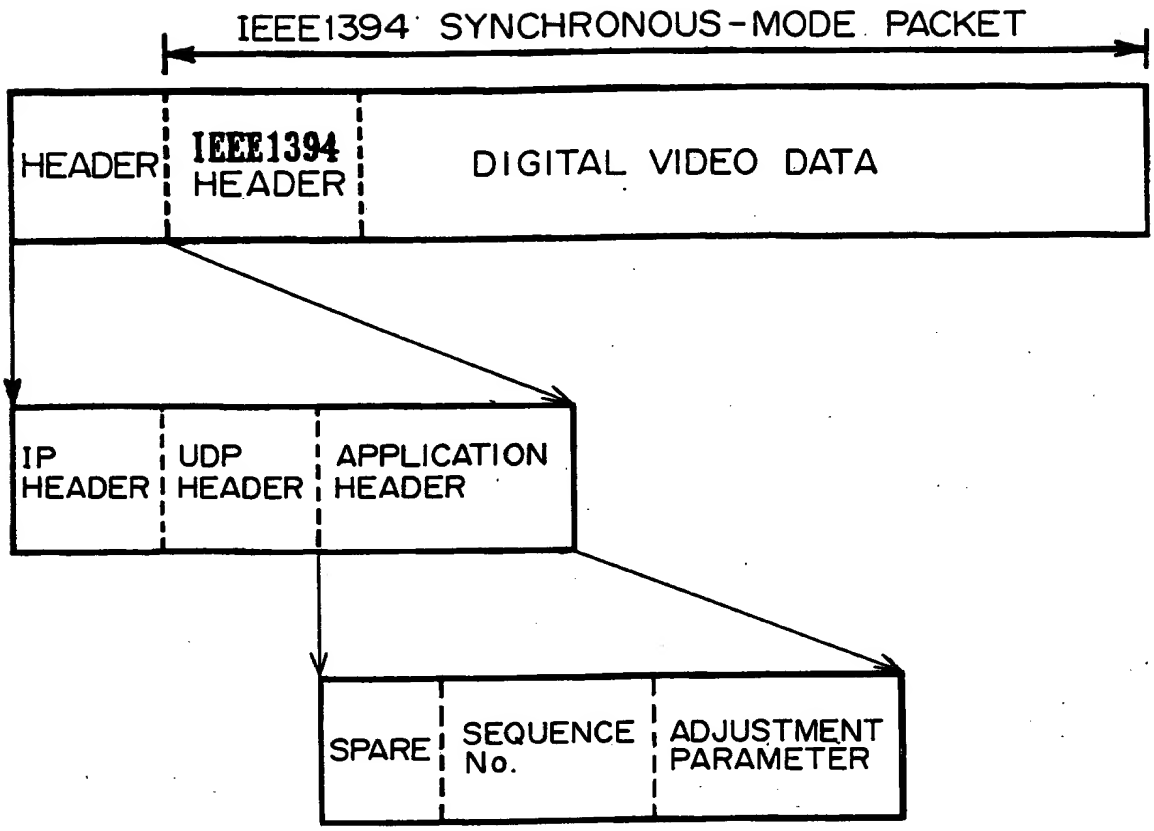


FIG. 4 PRIOR ART

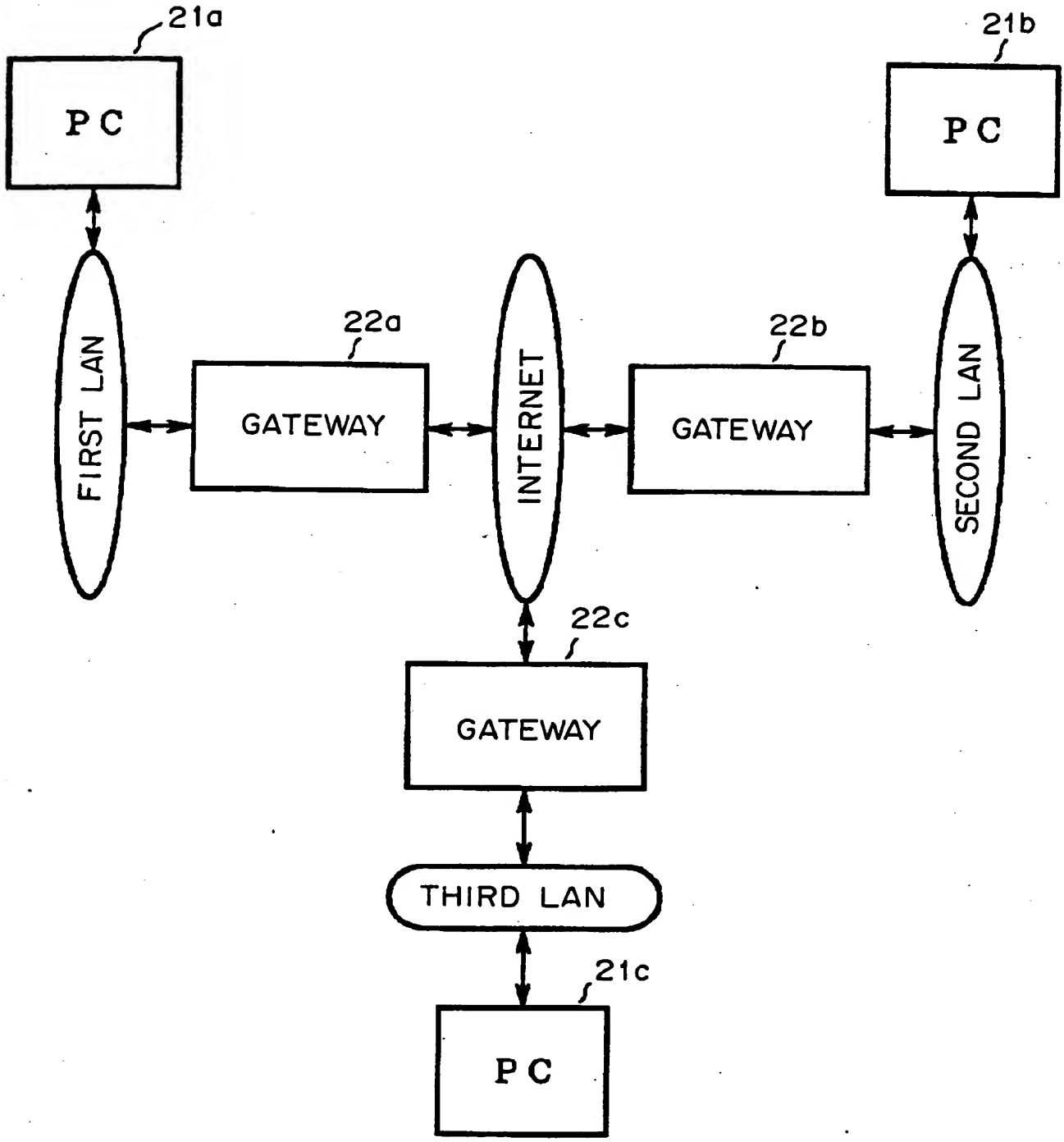


FIG. 5 PRIOR ART

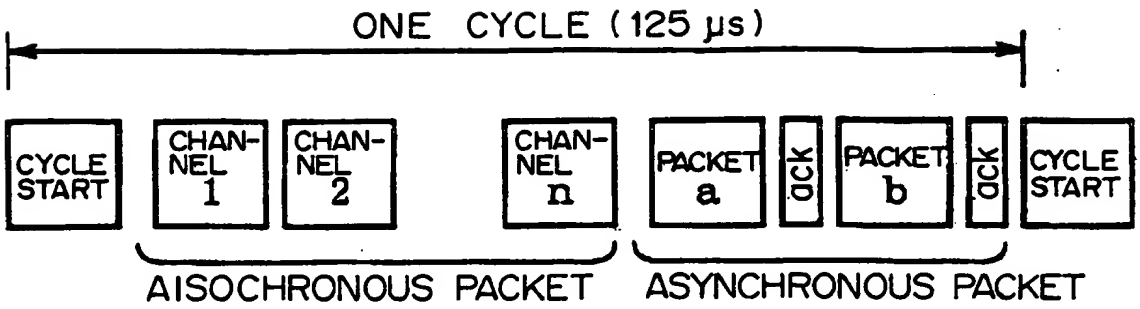


FIG. 6A PRIOR ART

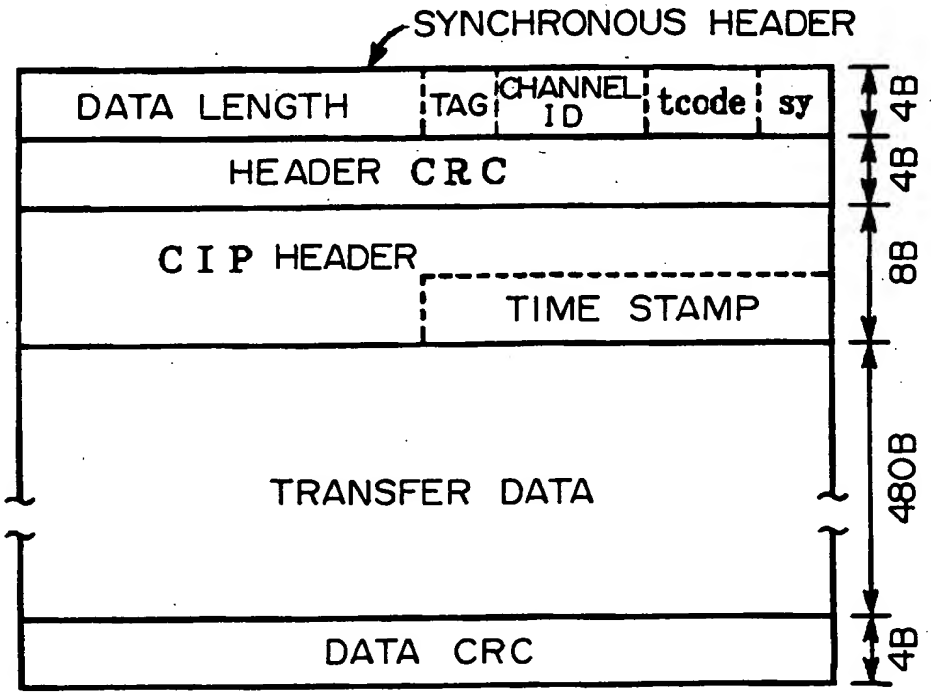


FIG. 6B PRIOR ART

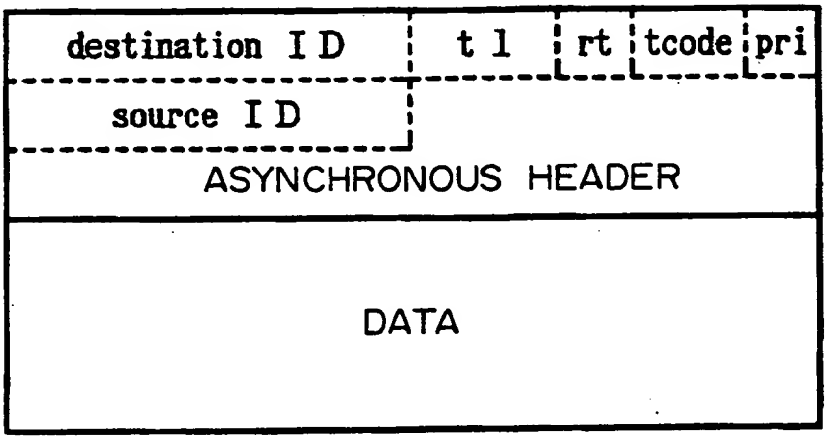


FIG. 6C PRIOR ART

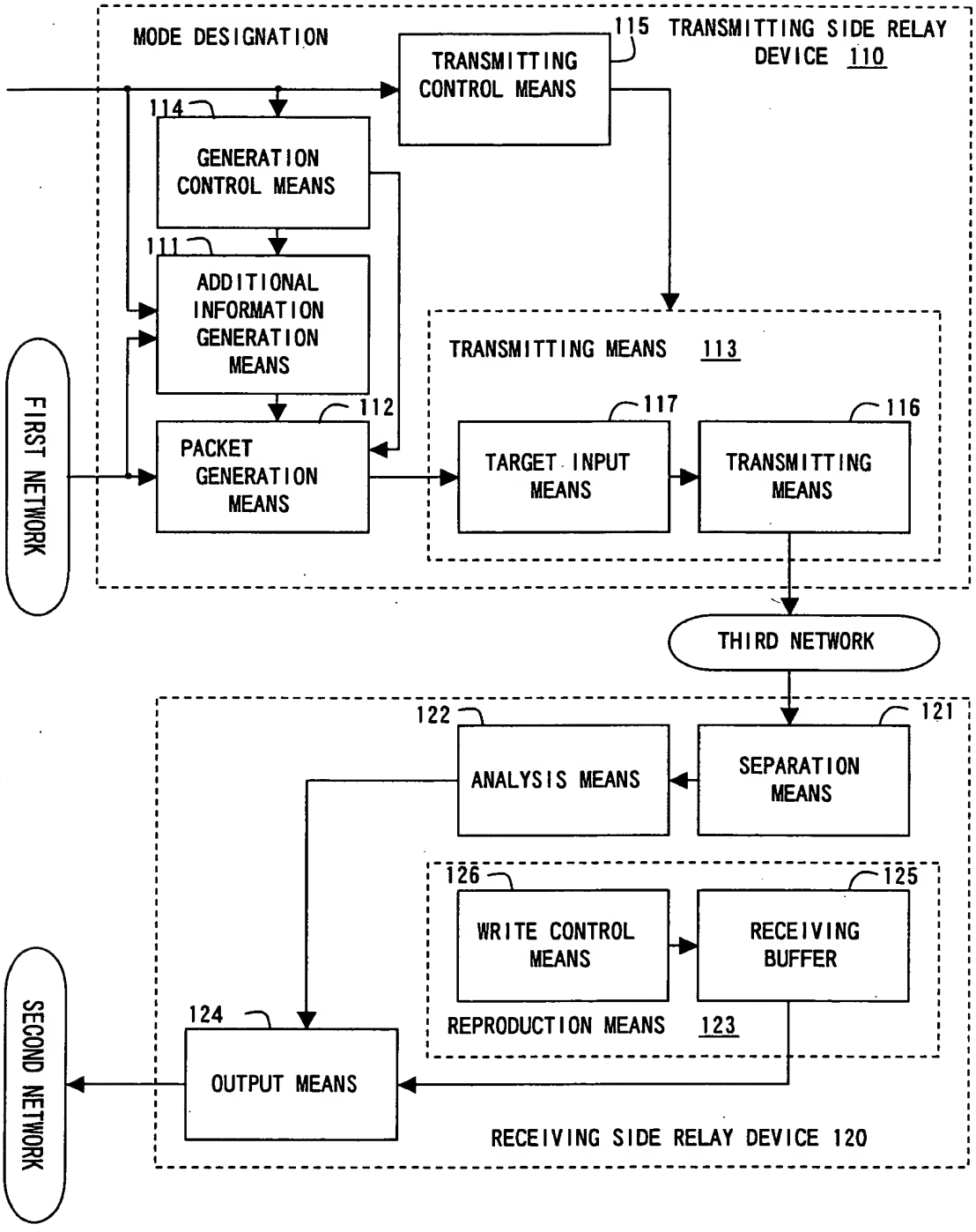

MODE DESIGNATION
115
TRANSMITTING SIDE RELAY DEVICE 110
TRANSMITTING CONTROL MEANS
114
GENERATION CONTROL MEANS
111
ADDITIONAL INFORMATION GENERATION MEANS
112
PACKET GENERATION MEANS
TRANSMITTING MEANS 113
117
TARGET INPUT MEANS
116
TRANSMITTING MEANS
FIRST NETWORK
THIRD NETWORK
122
ANALYSIS MEANS
121
SEPARATION MEANS
126
WRITE CONTROL MEANS
125
RECEIVING BUFFER
REPRODUCTION MEANS 123
124
OUTPUT MEANS
SECOND NETWORK
RECEIVING SIDE RELAY DEVICE 120

FIG. 7

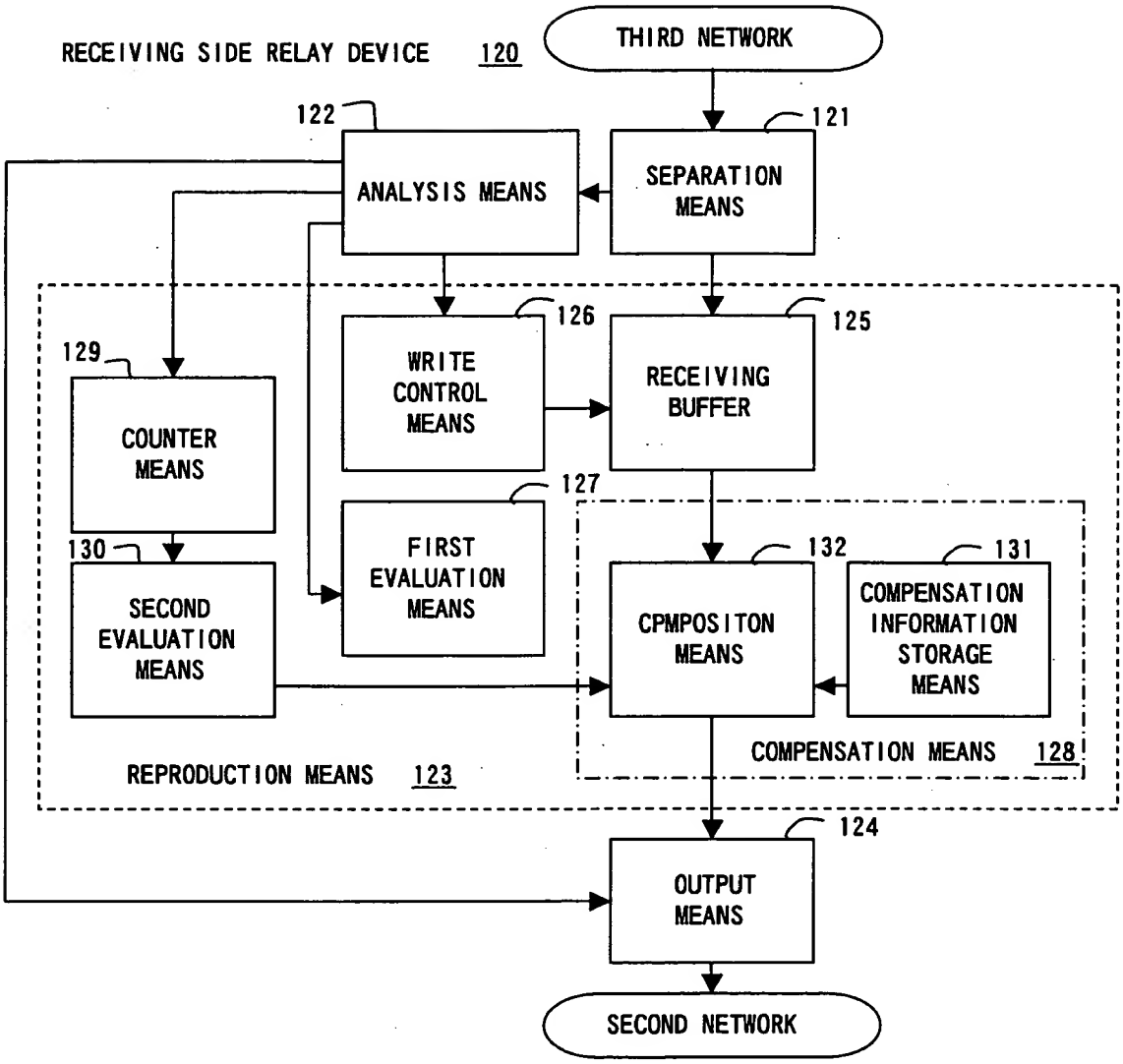

RECEIVING SIDE RELAY DEVICE 120
THIRD NETWORK
122
121
ANALYSIS MEANS
SEPARATION MEANS
126
125
129
WRITE CONTROL MEANS
RECEIVING BUFFER
COUNTER MEANS
127
130
132
131
FIRST EVALUATION MEANS
SECOND EVALUATION MEANS
CPMPOSITON MEANS
COMPENSATION INFORMATION STORAGE MEANS
COMPENSATION MEANS 128
REPRODUCTION MEANS 123
124
OUTPUT MEANS
SECOND NETWORK

FIG. 8

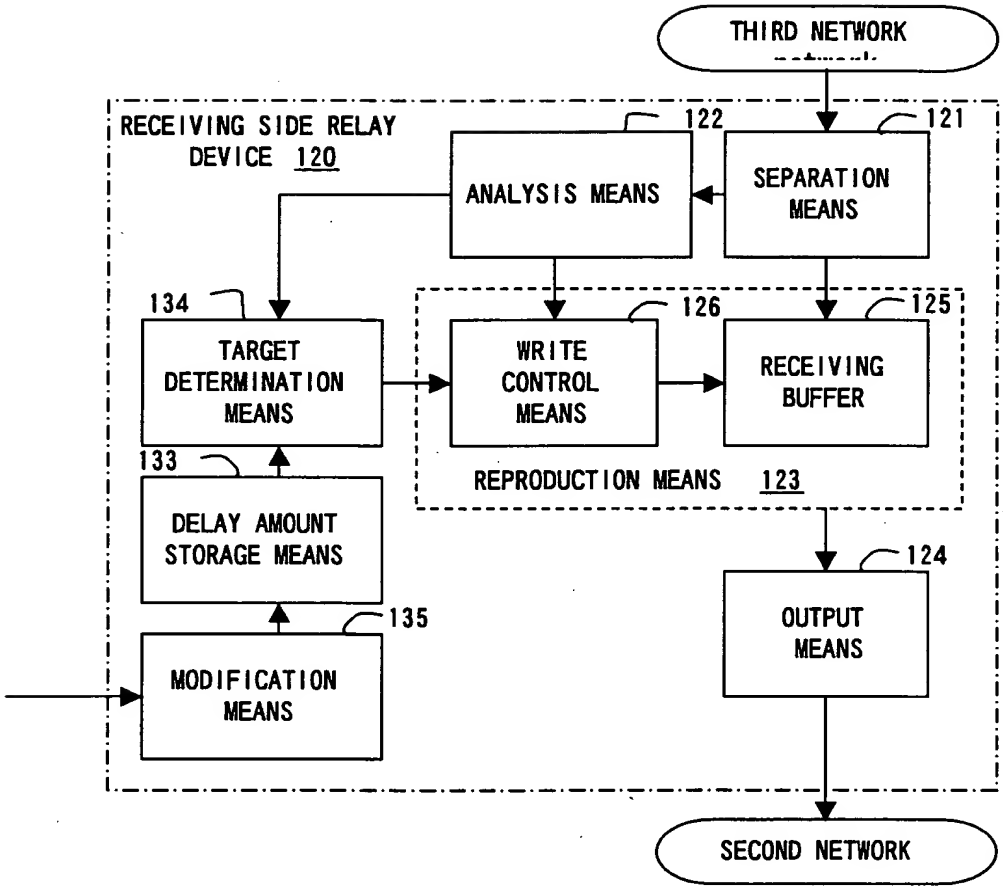

THIRD NETWORK
RECEIVING SIDE RELAY DEVICE 120
122
121
ANALYSIS MEANS
SEPARATION MEANS
134
126
125
TARGET DETERMINATION MEANS
WRITE CONTROL MEANS
RECEIVING BUFFER
133
REPRODUCTION MEANS 123
DELAY AMOUNT STORAGE MEANS
124
OUTPUT MEANS
135
MODIFICATION MEANS
SECOND NETWORK

FIG. 9

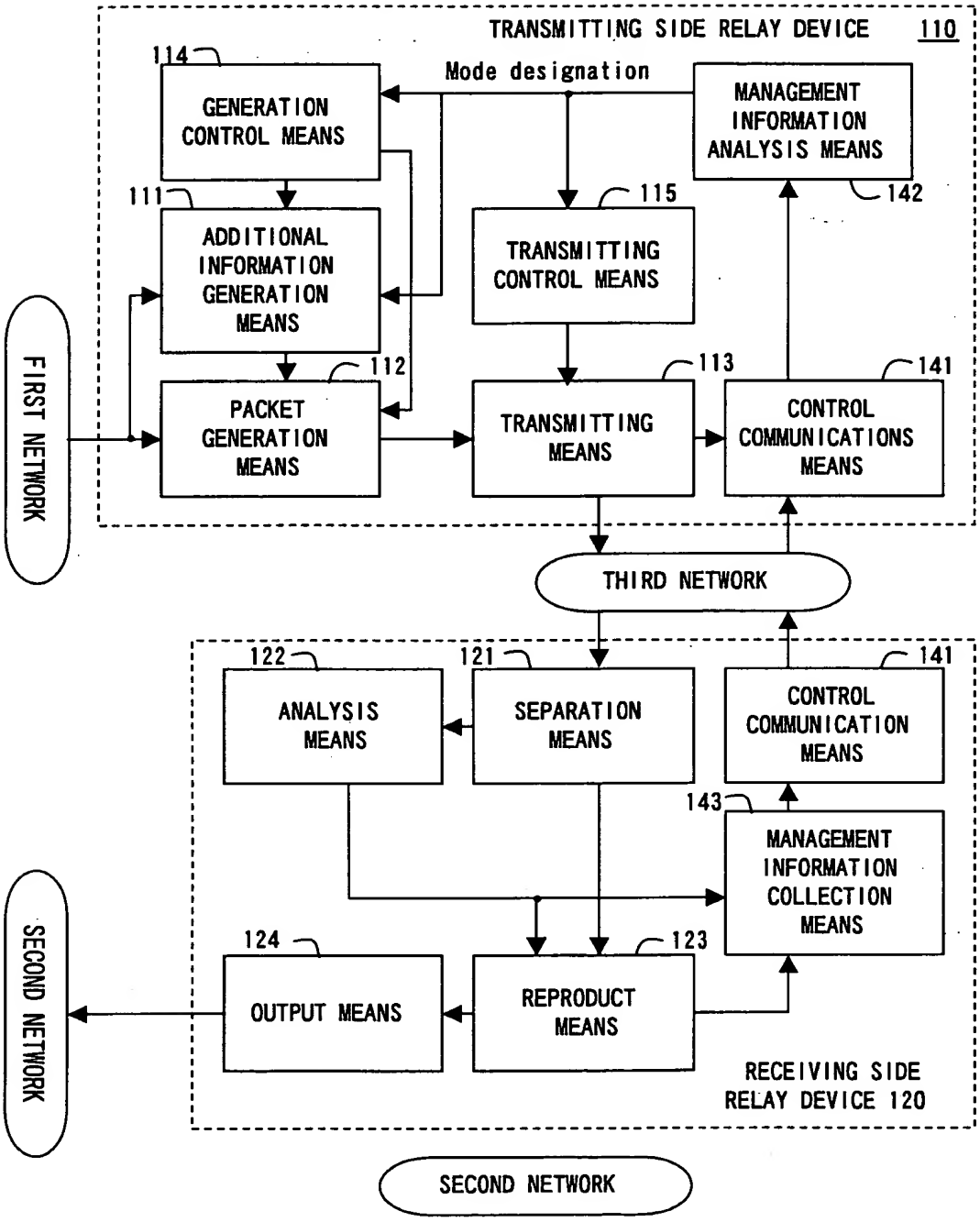

TRANSMITTING SIDE RELAY DEVICE 110
114
GENERATION CONTROL MEANS
Mode designation
MANAGEMENT INFORMATION ANALYSIS MEANS
142
111
ADDITIONAL INFORMATION GENERATION MEANS
115
TRANSMITTING CONTROL MEANS
FIRST NETWORK
112
PACKET GENERATION MEANS
113
TRANSMITTING MEANS
141
CONTROL COMMUNICATIONS MEANS
THIRD NETWORK
122
ANALYSIS MEANS
121
SEPARATION MEANS
141
CONTROL COMMUNICATION MEANS
143
MANAGEMENT INFORMATION COLLECTION MEANS
SECOND NETWORK
124
OUTPUT MEANS
123
REPRODUCT MEANS
RECEIVING SIDE RELAY DEVICE 120
SECOND NETWORK

FIG. 10

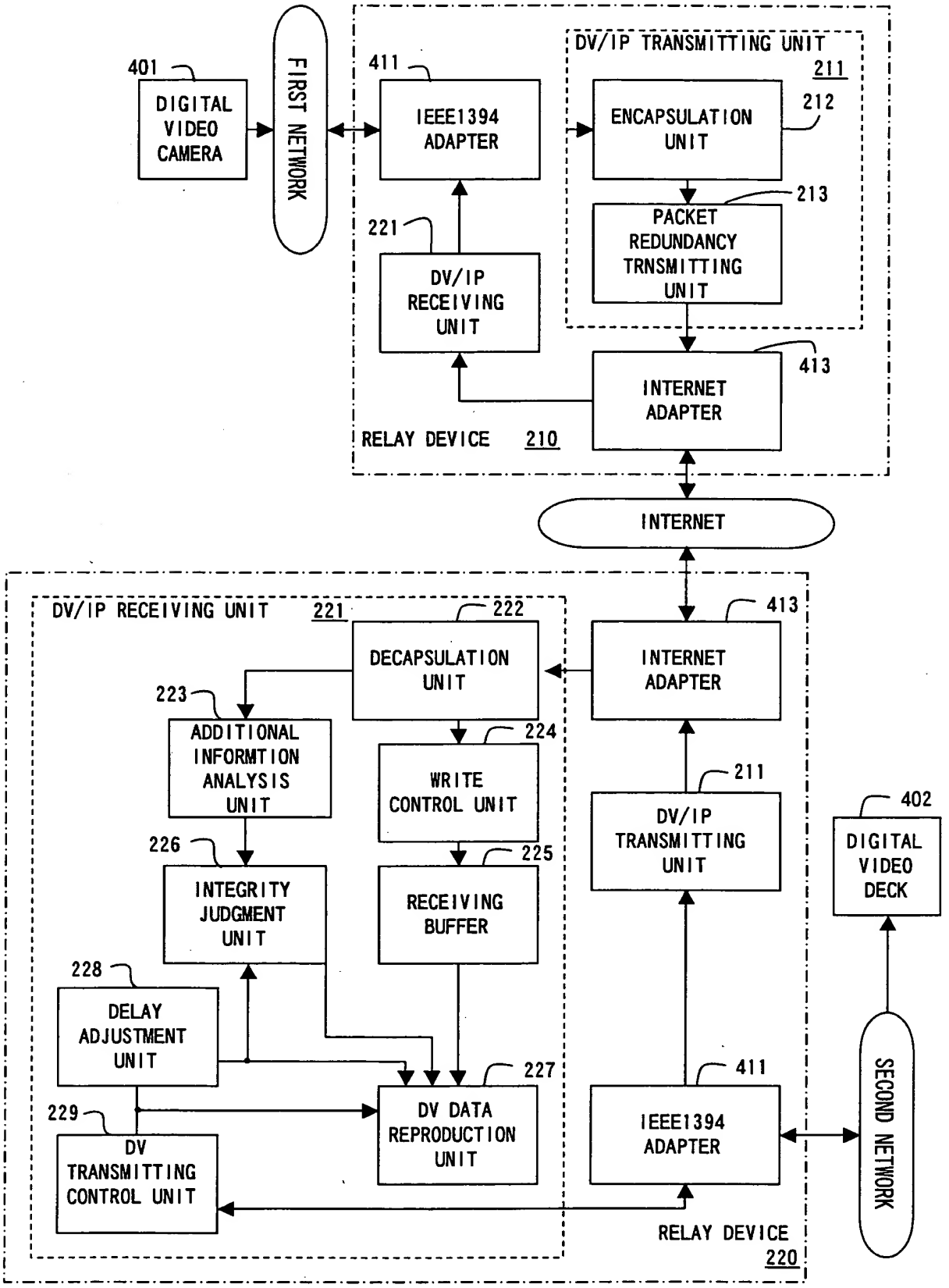

401
DIGITAL VIDEO CAMERA
FIRST NETWORK
411
IEEE1394 ADAPTER
DV/IP TRANSMITTING UNIT
211
ENCAPSULATION UNIT
212
213
PACKET REDUNDANCY TRNSMITTING UNIT
221
DV/IP RECEIVING UNIT
413
INTERNET ADAPTER
RELAY DEVICE 210
INTERNET
DV/IP RECEIVING UNIT 221
222
DECAPSULATION UNIT
413
INTERNET ADAPTER
223
ADDITIONAL INFORMTION ANALYSIS UNIT
224
WRITE CONTROL UNIT
211
DV/IP TRANSMITTING UNIT
402
DIGITAL VIDEO DECK
226
INTEGRITY JUDGMENT UNIT
225
RECEIVING BUFFER
228
DELAY ADJUSTMENT UNIT
227
411
229
DV TRANSMITTING CONTROL UNIT
DV DATA REPRODUCTION UNIT
IEEE1394 ADAPTER
SECOND NETWORK
RELAY DEVICE 220

FIG. 11

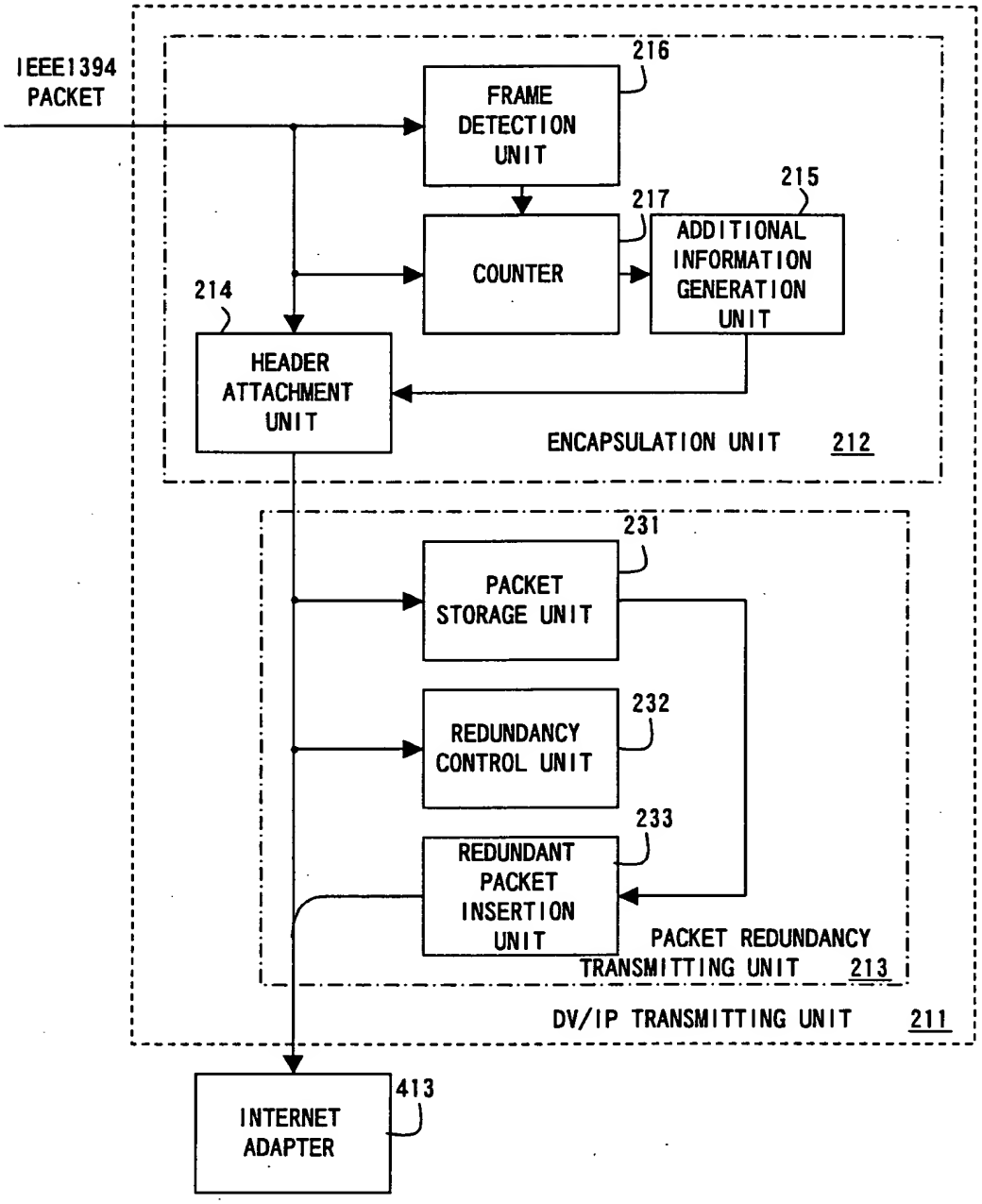
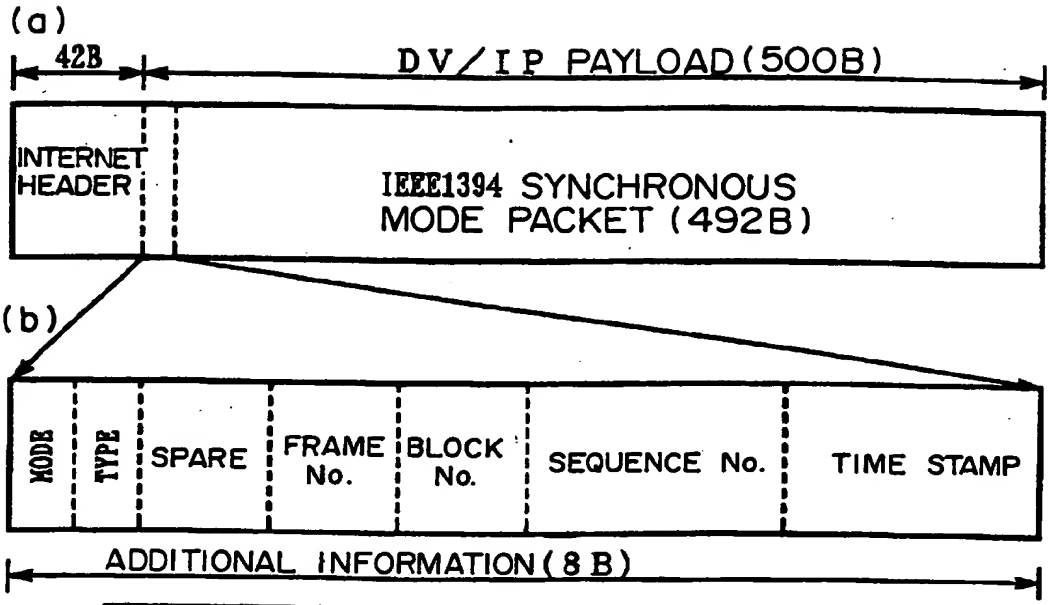

IEEE1394
PACKET
216
FRAME
DETECTION
UNIT
215
217
ADDITIONAL
INFORMATION
GENERATION
UNIT
COUNTER
214
HEADER
ATTACHMENT
UNIT
ENCAPSULATION UNIT 212
231
PACKET
STORAGE UNIT
232
REDUNDANCY
CONTROL UNIT
233
REDUNDANT
PACKET
INSERTION
UNIT
PACKET REDUNDANCY
TRANSMITTING UNIT 213
DV/IP TRANSMITTING UNIT 211
413
INTERNET
ADAPTER

FIG. 12



(c)

DATA TYPE	TYPE OF PACKET
DT0	hhhhhh
DT1	vvvvvv
DT2	empty
DT3	av MIXTURE
DT4	avvvvv
DT5	vavvvv
DT6	vvavvv
DT7	vvvavv
DT8	vvvvav
DT9	vvvvva
DT10	CONTROL PACKET

(d)

TRANSMITTING MODE	TRANSMITTING PROCESS CONTENT
mode0	TIME-LAPSE
mode1	ONLY VOICE
mode2	ONLY PICTURE
mode3	NORMAL

FIG. 13

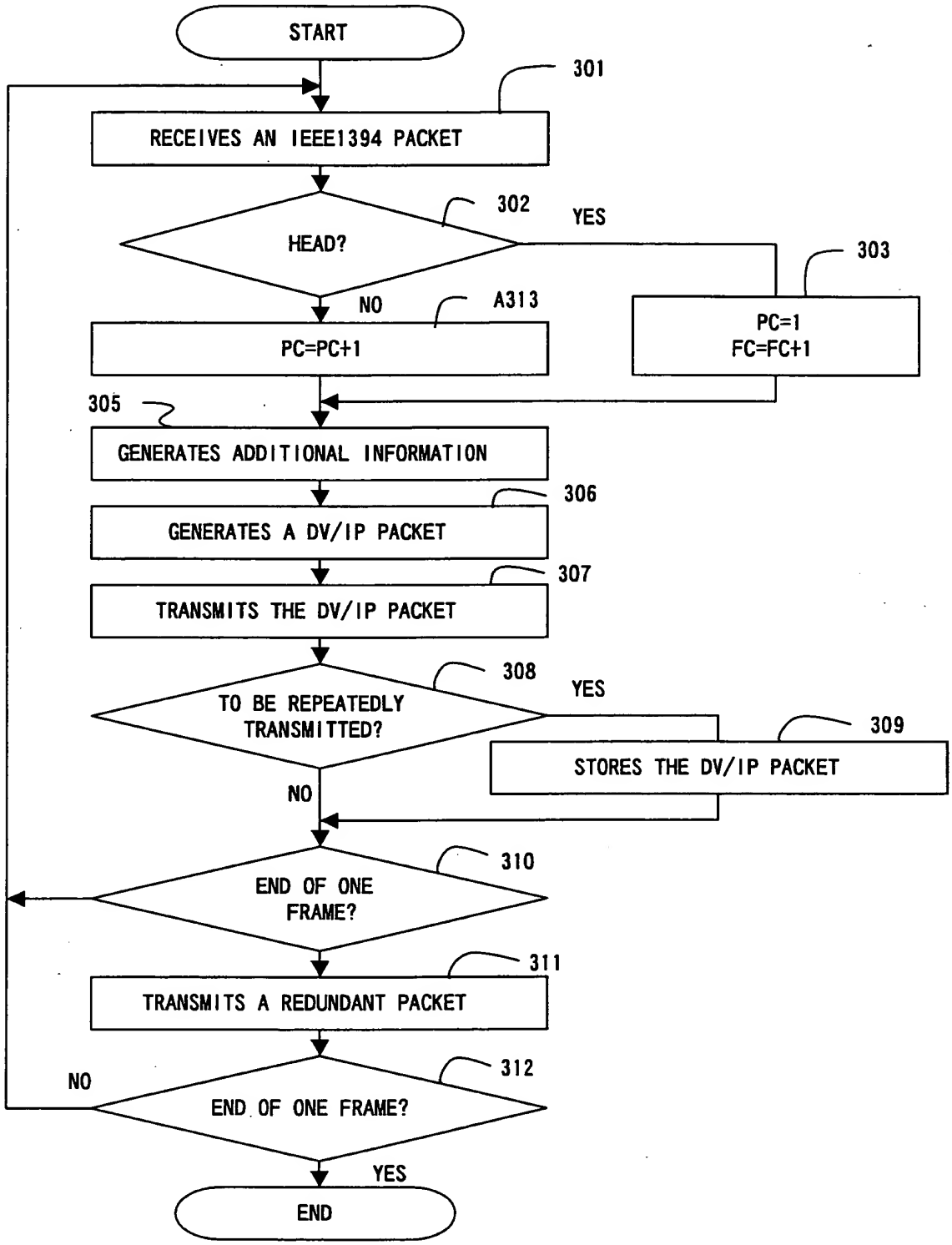

START
301
RECEIVES AN IEEE1394 PACKET
302
HEAD?
YES
303
NO
A313
PC=PC+1
PC=1
FC=FC+1
305
GENERATES ADDITIONAL INFORMATION
306
GENERATES A DV/IP PACKET
307
TRANSMITS THE DV/IP PACKET
308
TO BE REPEATEDLY TRANSMITTED?
YES
309
STORES THE DV/IP PACKET
NO
310
END OF ONE FRAME?
311
TRANSMITS A REDUNDANT PACKET
312
NO
END OF ONE FRAME?
YES
END

FIG. 14

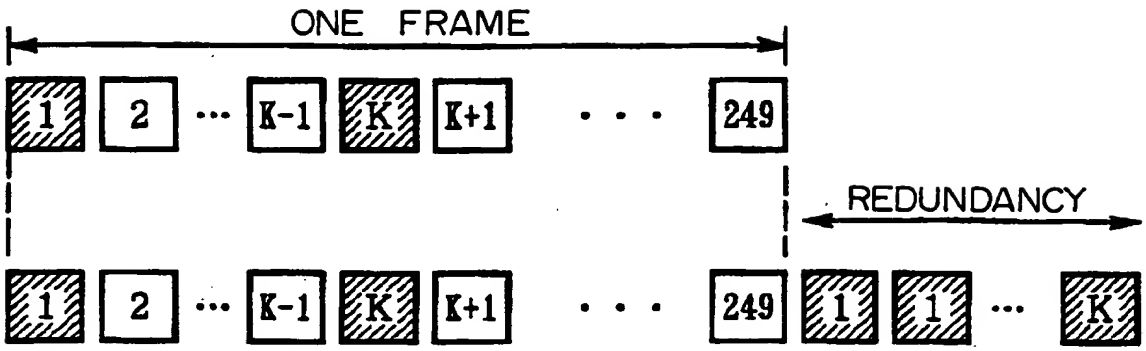


FIG. 15A

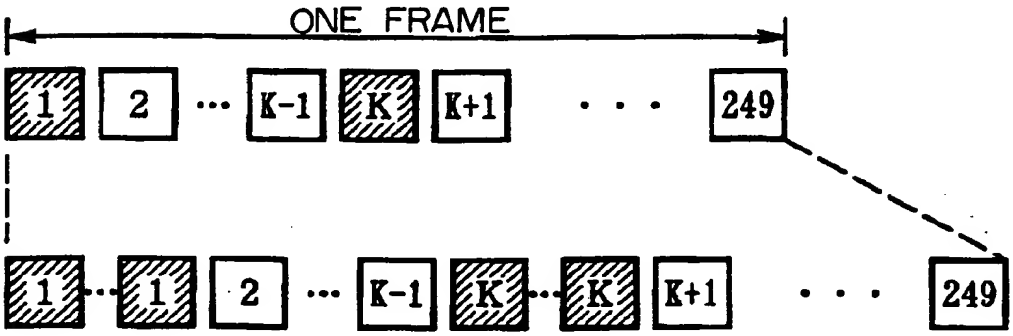


FIG. 15B

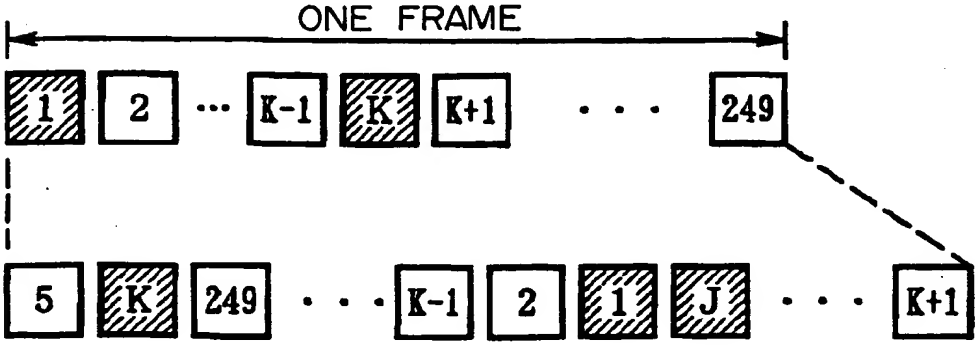


FIG. 15C

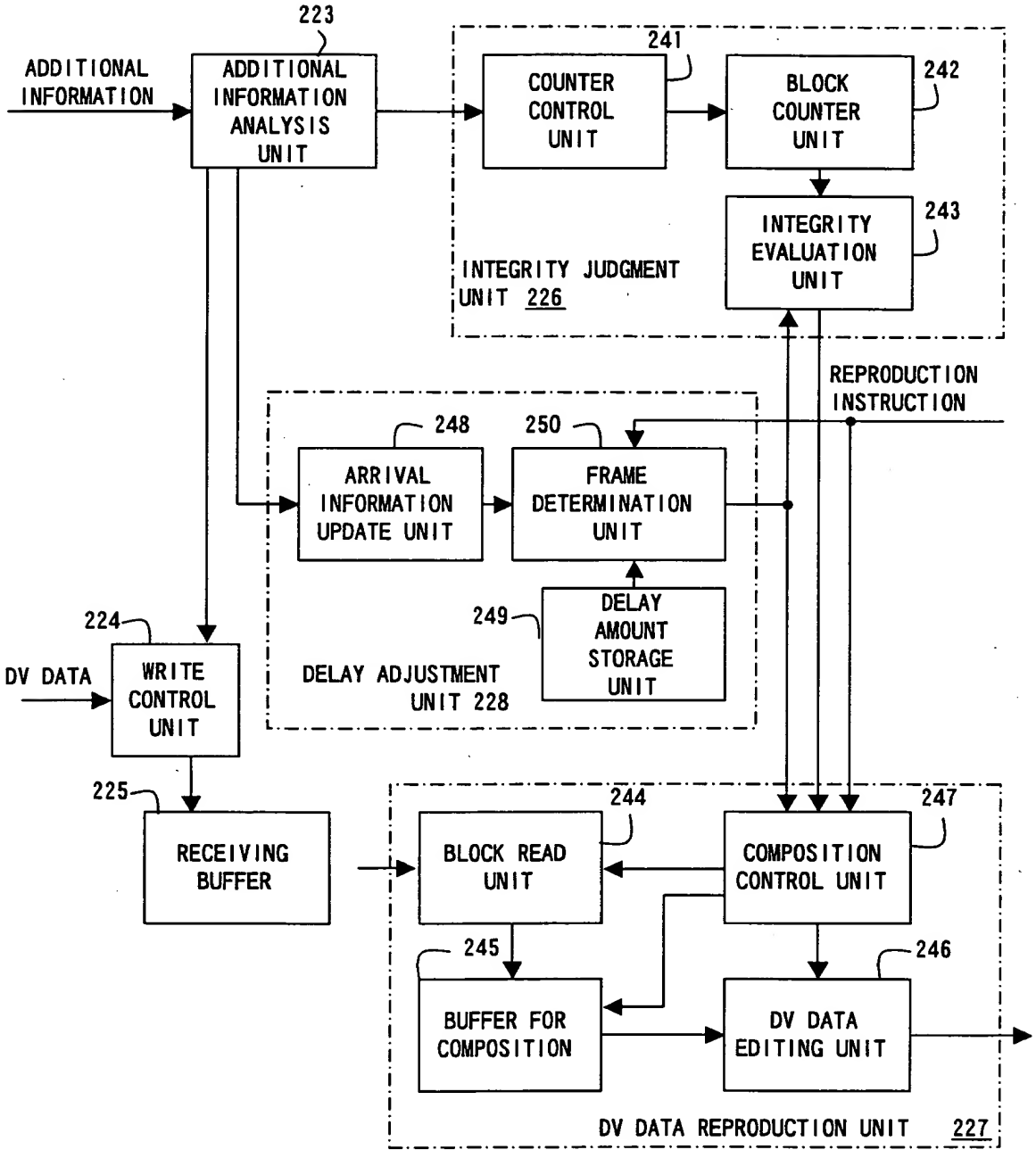

223
ADDITIONAL INFORMATION
ADDITIONAL INFORMATION ANALYSIS UNIT
241
COUNTER CONTROL UNIT
242
BLOCK COUNTER UNIT
243
INTEGRITY EVALUATION UNIT
INTEGRITY JUDGMENT UNIT 226
REPRODUCTION INSTRUCTION
248
ARRIVAL INFORMATION UPDATE UNIT
250
FRAME DETERMINATION UNIT
249
DELAY AMOUNT STORAGE UNIT
DELAY ADJUSTMENT UNIT 228
224
DV DATA
WRITE CONTROL UNIT
225
RECEIVING BUFFER
244
BLOCK READ UNIT
247
COMPOSITION CONTROL UNIT
245
BUFFER FOR COMPOSITION
246
DV DATA EDITING UNIT
DV DATA REPRODUCTION UNIT 227

FIG. 16

BLOCK No.	FRAME(0)	FRAME(1)	・・・	FRAME(K)
0	$DV_{0,0}$	$DV_{1,0}$	・・・	$DV_{K,0}$
1	$DV_{0,1}$	$DV_{1,1}$	・・・	$DV_{K,1}$
2	$DV_{0,2}$	$DV_{1,2}$	・・・	$DV_{K,2}$
・	・	・	・	・
・	・	・	・	・
・	・	・	・	・
249	$DV_{0,249}$	$DV_{1,249}$	・・・	$DV_{K,249}$

FIG. 17A

	FRAME(0)	FRAME(1)	・・・	FRAME(K)
RECEIVING BLOCK	RBC0	RBC1	・・・	RBCK
FRAME HEADER	FHC0	FHC1	・・・	FHCK
AUDIO BLOCK	ABC0	ABC1	・・・	ABCK
VIDEO BLOCK	VBC0	VBC1	・・・	VBCK

FIG. 17B

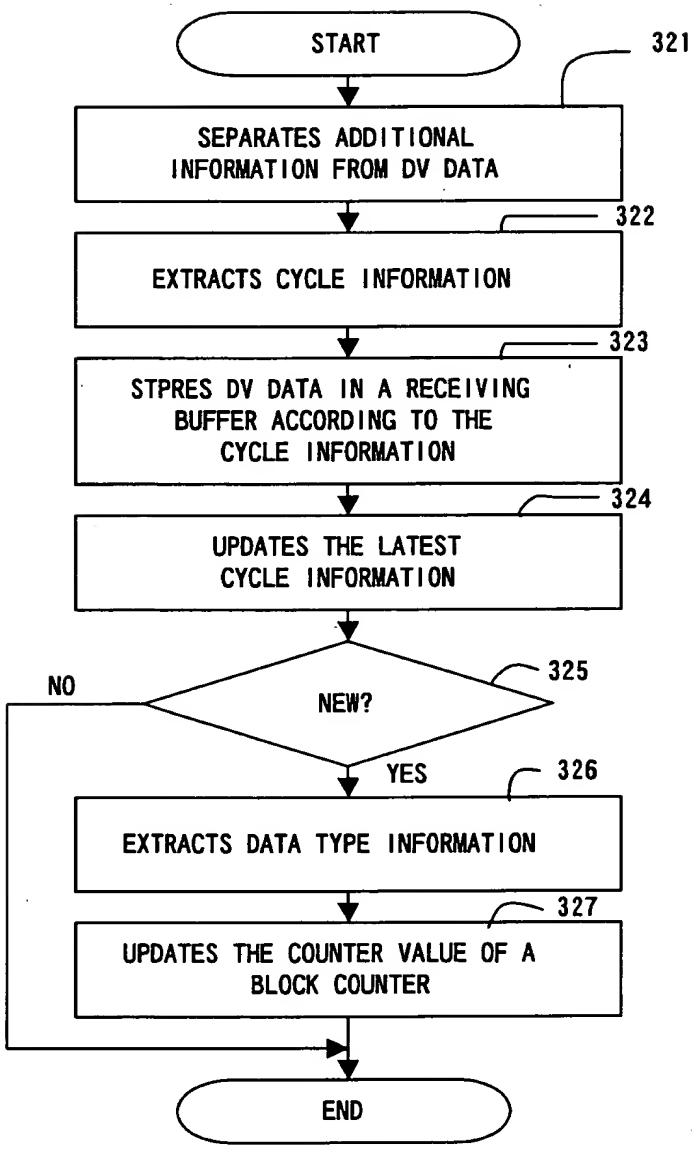

START
321
SEPARATES ADDITIONAL INFORMATION FROM DV DATA
322
EXTRACTS CYCLE INFORMATION
323
STPRES DV DATA IN A RECEIVING BUFFER ACCORDING TO THE CYCLE INFORMATION
324
UPDATES THE LATEST CYCLE INFORMATION
325
NEW?
NO
YES
326
EXTRACTS DATA TYPE INFORMATION
327
UPDATES THE COUNTER VALUE OF A BLOCK COUNTER
END

FIG. 18A

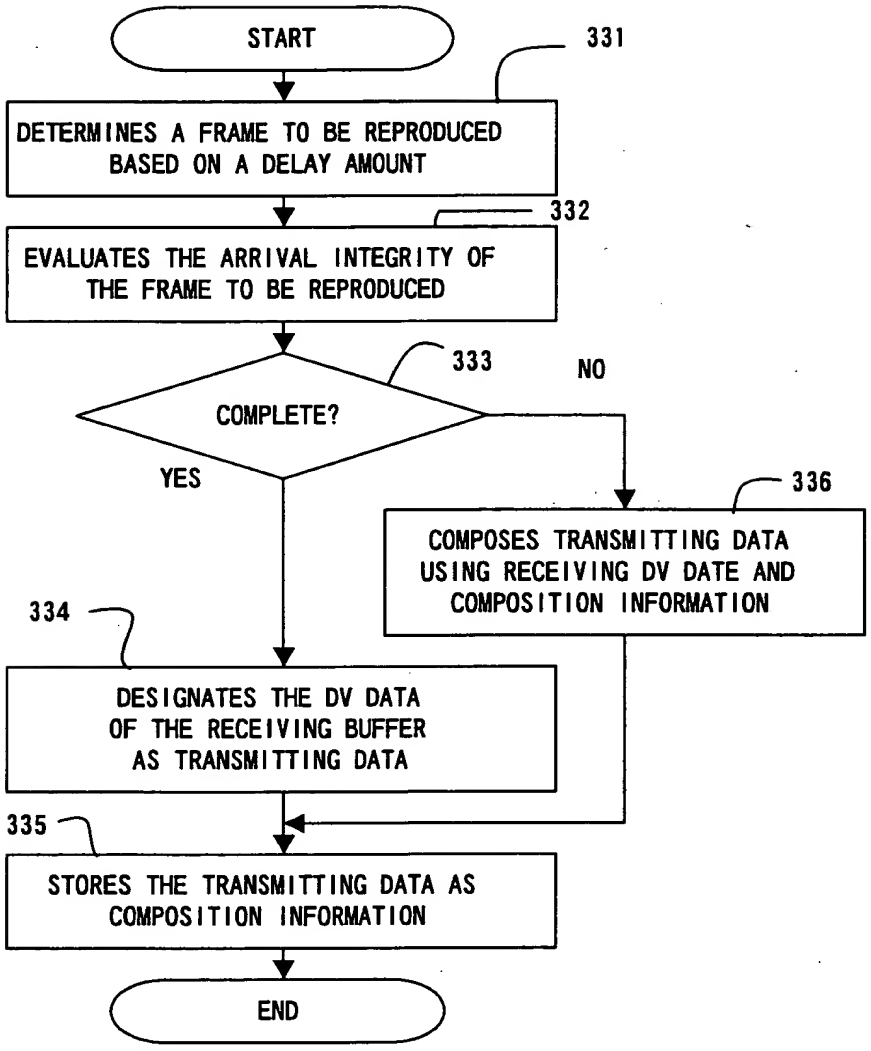

START
331
DETERMINES A FRAME TO BE REPRODUCED BASED ON A DELAY AMOUNT
332
EVALUATES THE ARRIVAL INTEGRITY OF THE FRAME TO BE REPRODUCED
333
COMPLETE?
NO
YES
336
COMPOSES TRANSMITTING DATA USING RECEIVING DV DATE AND COMPOSITION INFORMATION
334
DESIGNATES THE DV DATA OF THE RECEIVING BUFFER AS TRANSMITTING DATA
335
STORES THE TRANSMITTING DATA AS COMPOSITION INFORMATION
END

FIG. 18B

FIRST BUFFER	SECOND BUFFER
$DV_{(n-1,\ 0)}$	$DV_{(n,\ 0)}$
$DV_{(n-1,\ 1)}$	$DV_{(n,\ 1)}$
$DV_{(n-1,\ 2)}$	LOST
⋮	⋮
$DV_{(n-1,\ 249)}$	$DV_{(n,\ 249)}$

PACKET No.	TRANSMITTING DATA
0	$DV_{(n,\ 0)}$
1	$DV_{(n,\ 1)}$
2	$DV_{(n-1,\ 2)}$
⋮	⋮
249	$DV_{(n,\ 249)}$

FIG. 19A

PACKET No.	FIRST BUFFER	SECOND BUFFER
0	FH_{n-1}	FH_{n}
1	$a_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$	$a_{n}\ V_{n}\ V_{n}\ V_{n}\ V_{n}\ V_{n}$
2	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$	LOST
3	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ a_{n-1}\ V_{n-1}$	$V_{n}\ V_{n}\ V_{n}\ V_{n}\ a_{n}\ V_{n}$
⋮	⋮	⋮
249	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$	LOST

FIG. 19B

PACKET No.	TRANSMITTING DATA
0	FH_{n-1}
1	$a_{n}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$
2	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$
3	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ a_{n}\ V_{n-1}$
⋮	⋮
249	$V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}\ V_{n-1}$

FIG. 19C

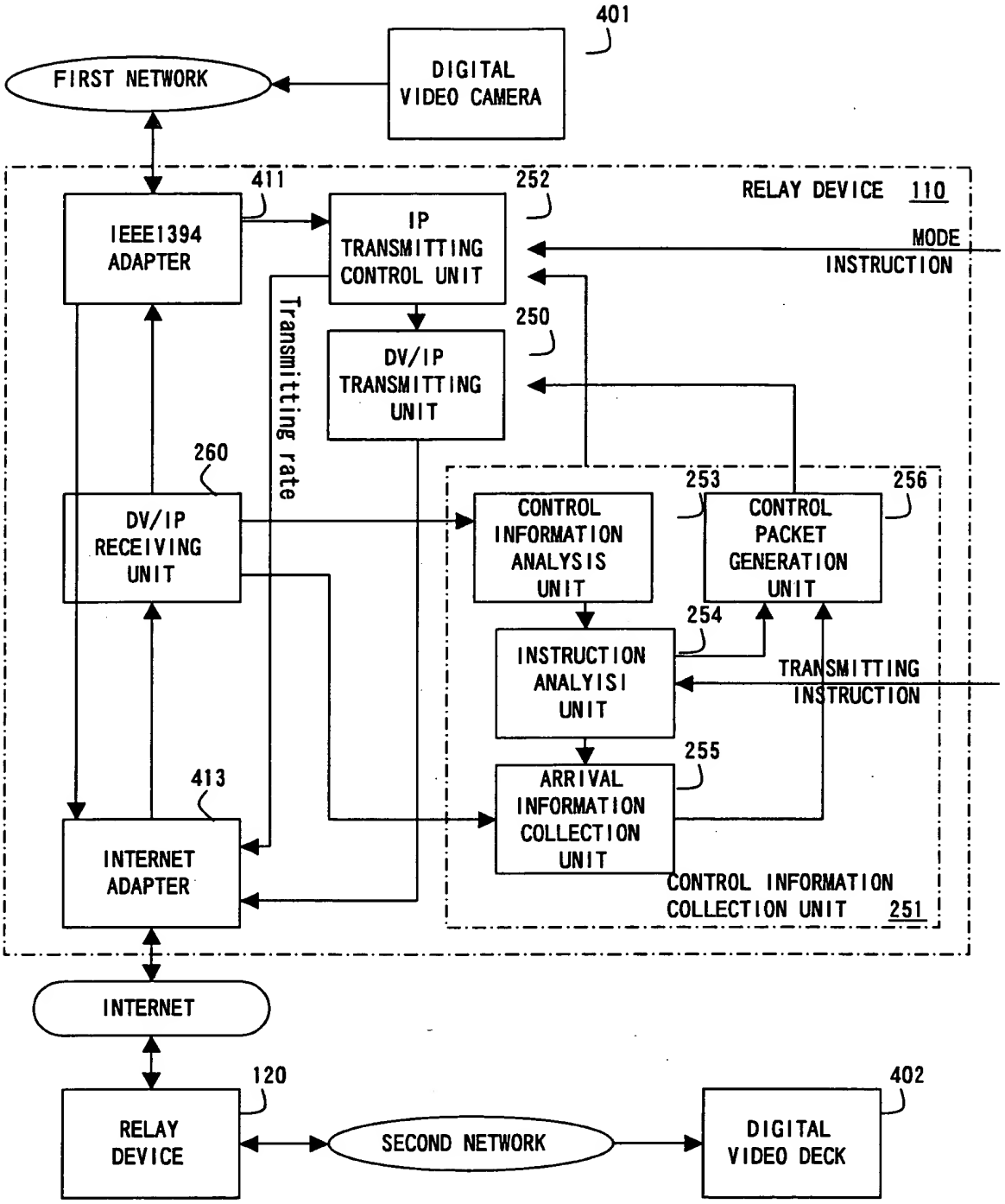

401
DIGITAL VIDEO CAMERA
FIRST NETWORK
411
252
RELAY DEVICE 110
IEEE1394 ADAPTER
IP TRANSMITTING CONTROL UNIT
MODE INSTRUCTION
Transmitting rate
250
DV/IP TRANSMITTING UNIT
260
253
256
DV/IP RECEIVING UNIT
CONTROL INFORMATION ANALYSIS UNIT
CONTROL PACKET GENERATION UNIT
254
INSTRUCTION ANALYSIS UNIT
TRANSMITTING INSTRUCTION
255
413
ARRIVAL INFORMATION COLLECTION UNIT
INTERNET ADAPTER
CONTROL INFORMATION COLLECTION UNIT 251
INTERNET
120
402
RELAY DEVICE
SECOND NETWORK
DIGITAL VIDEO DECK

FIG. 20

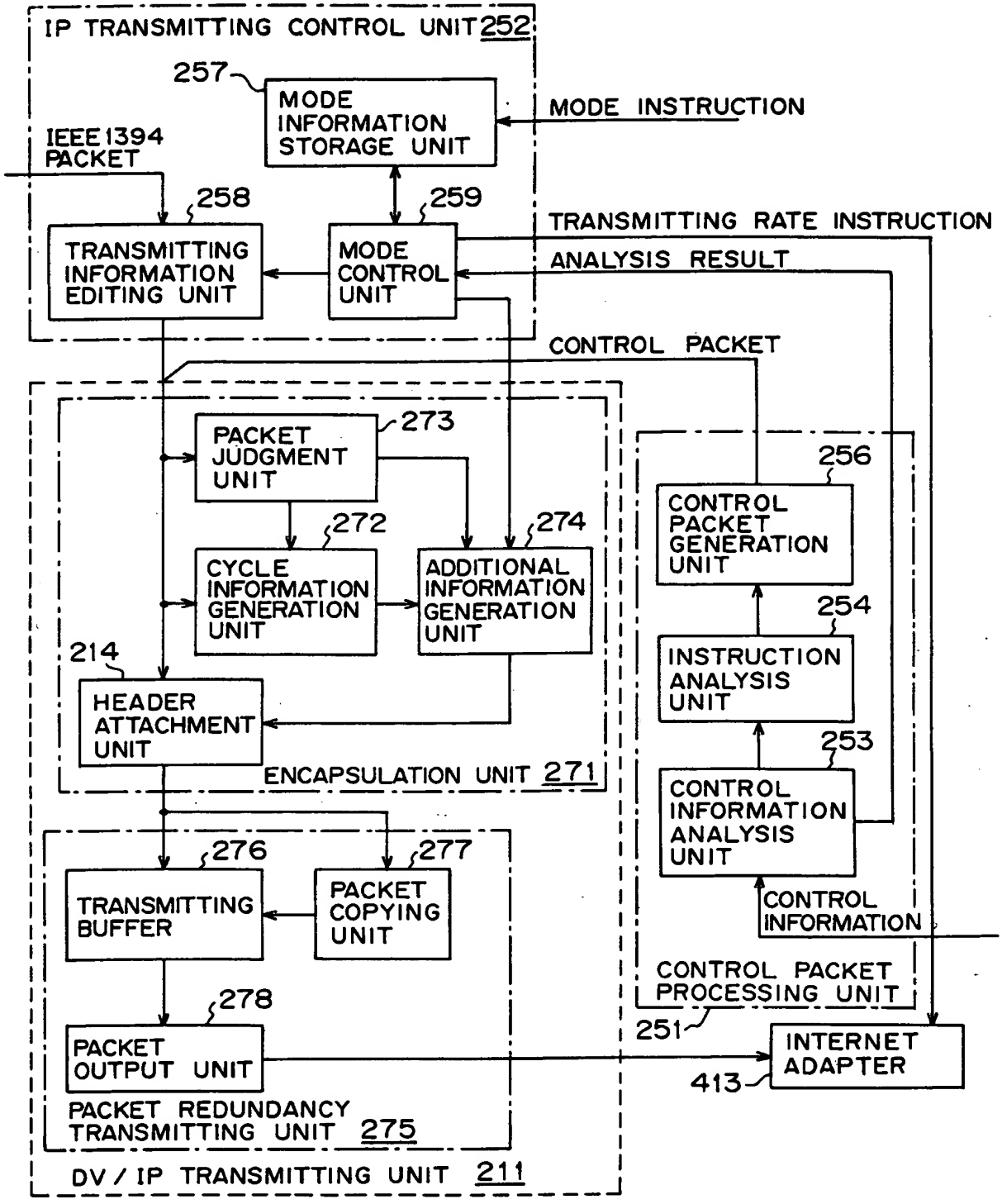

IP TRANSMITTING CONTROL UNIT 252
257
MODE INFORMATION STORAGE UNIT
MODE INSTRUCTION
IEEE1394 PACKET
258
259
TRANSMITTING INFORMATION EDITING UNIT
MODE CONTROL UNIT
TRANSMITTING RATE INSTRUCTION
ANALYSIS RESULT
CONTROL PACKET
273
PACKET JUDGMENT UNIT
272
274
CYCLE INFORMATION GENERATION UNIT
ADDITIONAL INFORMATION GENERATION UNIT
214
HEADER ATTACHMENT UNIT
ENCAPSULATION UNIT 271
256
CONTROL PACKET GENERATION UNIT
254
INSTRUCTION ANALYSIS UNIT
253
CONTROL INFORMATION ANALYSIS UNIT
CONTROL INFORMATION
CONTROL PACKET PROCESSING UNIT
251
276
277
TRANSMITTING BUFFER
PACKET COPYING UNIT
278
PACKET OUTPUT UNIT
INTERNET ADAPTER
413
PACKET REDUNDANCY TRANSMITTING UNIT 275
DV / IP TRANSMITTING UNIT 211

FIG. 21

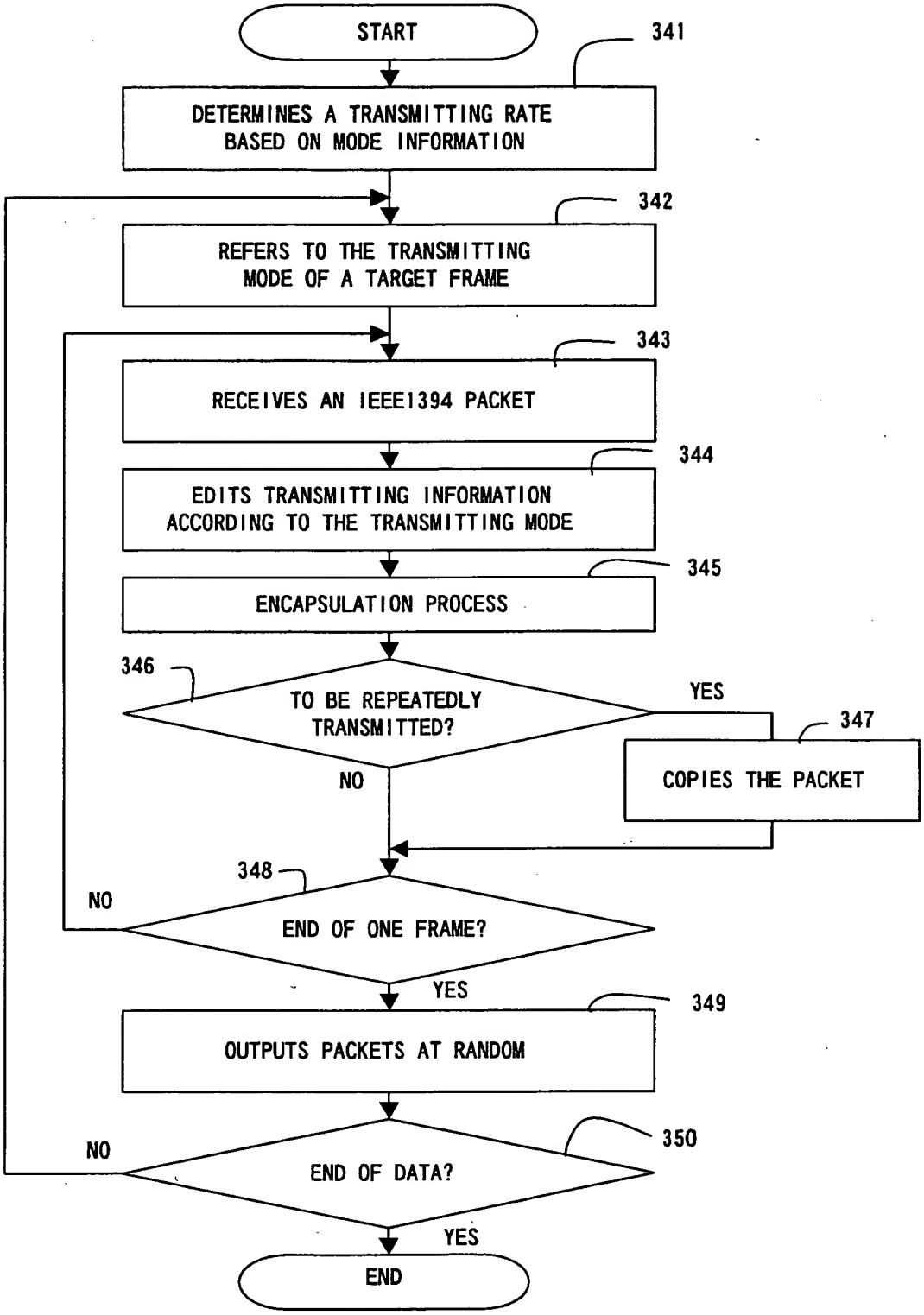

START
341
DETERMINES A TRANSMITTING RATE BASED ON MODE INFORMATION
342
REFERS TO THE TRANSMITTING MODE OF A TARGET FRAME
343
RECEIVES AN IEEE1394 PACKET
344
EDITS TRANSMITTING INFORMATION ACCORDING TO THE TRANSMITTING MODE
345
ENCAPSULATION PROCESS
346
TO BE REPEATEDLY TRANSMITTED?
YES
347
COPIES THE PACKET
NO
348
NO
END OF ONE FRAME?
YES
349
OUTPUTS PACKETS AT RANDOM
350
NO
END OF DATA?
YES
END

FIG. 22

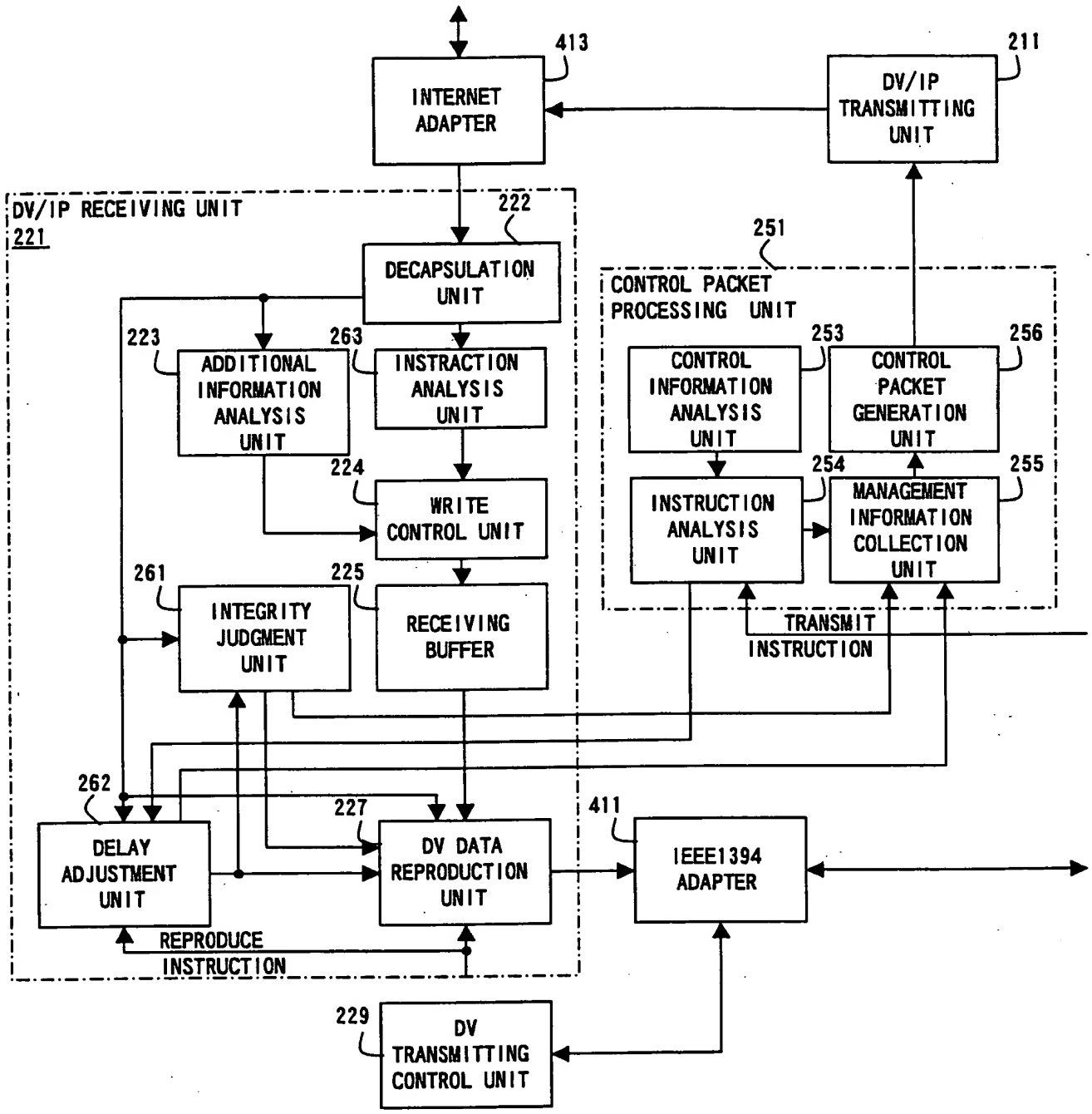

413
INTERNET ADAPTER
211
DV/IP TRANSMITTING UNIT
DV/IP RECEIVING UNIT
221
222
DECAPSULATION UNIT
251
CONTROL PACKET PROCESSING UNIT
223
ADDITIONAL INFORMATION ANALYSIS UNIT
263
INSTRACTION ANALYSIS UNIT
253
CONTROL INFORMATION ANALYSIS UNIT
256
CONTROL PACKET GENERATION UNIT
224
WRITE CONTROL UNIT
254
INSTRUCTION ANALYSIS UNIT
255
MANAGEMENT INFORMATION COLLECTION UNIT
261
INTEGRITY JUDGMENT UNIT
225
RECEIVING BUFFER
TRANSMIT INSTRUCTION
262
227
411
DELAY ADJUSTMENT UNIT
DV DATA REPRODUCTION UNIT
IEEE1394 ADAPTER
REPRODUCE INSTRUCTION
229
DV TRANSMITTING CONTROL UNIT

FIG. 23

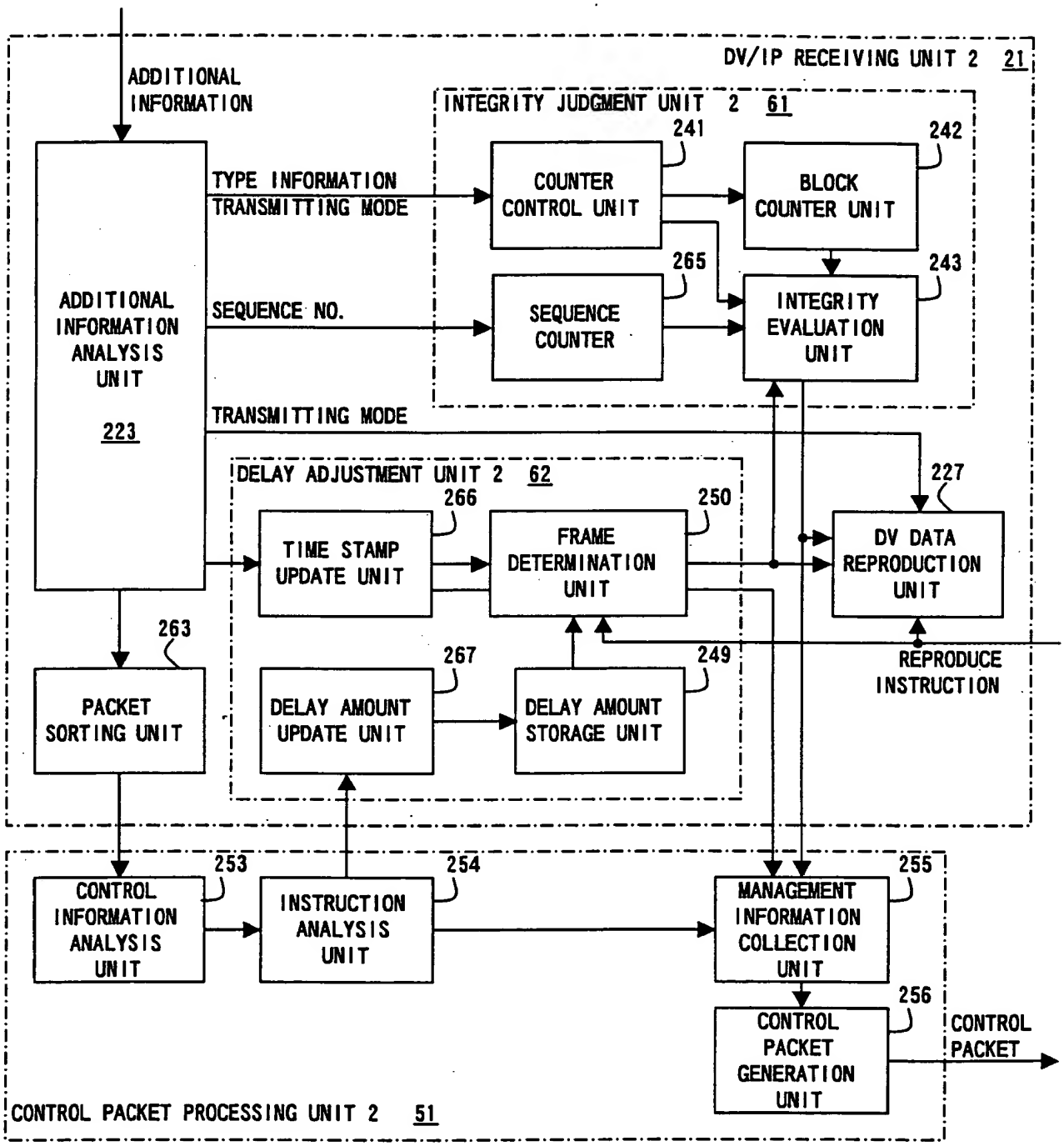

DV/IP RECEIVING UNIT 2 21
ADDITIONAL INFORMATION
INTEGRITY JUDGMENT UNIT 2 61
241
242
COUNTER CONTROL UNIT
BLOCK COUNTER UNIT
TYPE INFORMATION TRANSMITTING MODE
265
243
ADDITIONAL INFORMATION ANALYSIS UNIT
223
SEQUENCE NO.
SEQUENCE COUNTER
INTEGRITY EVALUATION UNIT
TRANSMITTING MODE
227
DELAY ADJUSTMENT UNIT 2 62
266
250
TIME STAMP UPDATE UNIT
FRAME DETERMINATION UNIT
DV DATA REPRODUCTION UNIT
263
267
249
REPRODUCE INSTRUCTION
PACKET SORTING UNIT
DELAY AMOUNT UPDATE UNIT
DELAY AMOUNT STORAGE UNIT
253
254
255
CONTROL INFORMATION ANALYSIS UNIT
INSTRUCTION ANALYSIS UNIT
MANAGEMENT INFORMATION COLLECTION UNIT
256
CONTROL PACKET GENERATION UNIT
CONTROL PACKET
CONTROL PACKET PROCESSING UNIT 2 51

FIG. 24

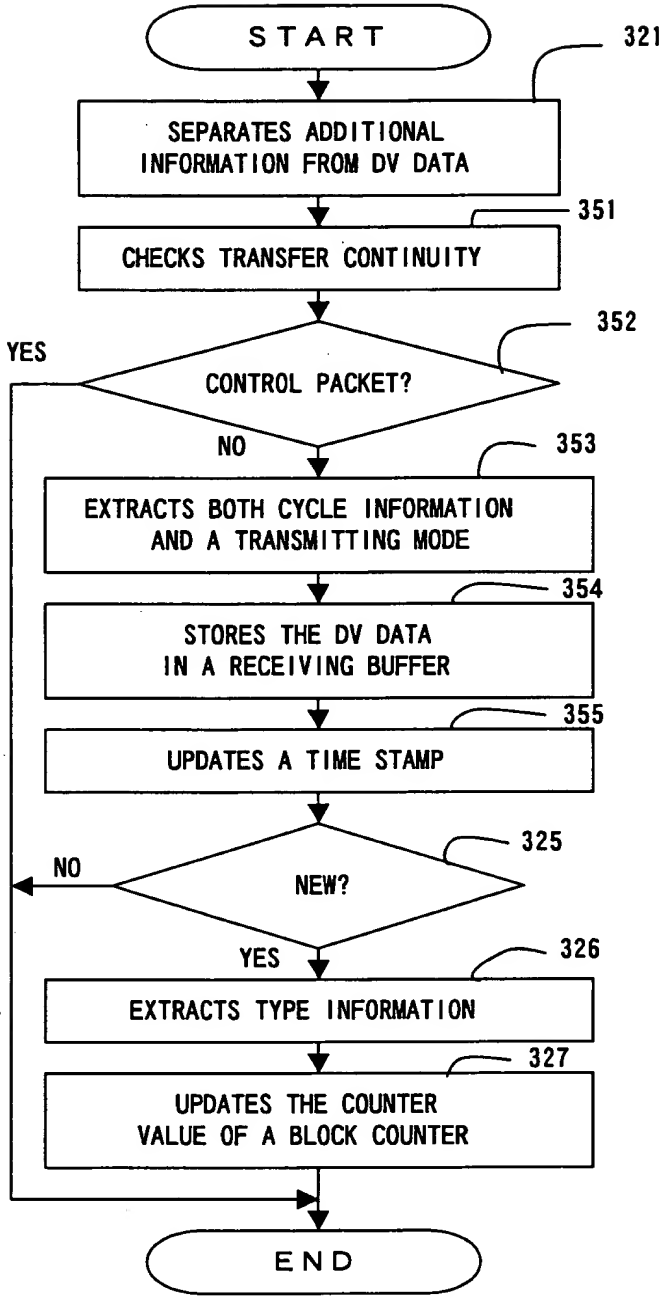

START
321
SEPARATES ADDITIONAL INFORMATION FROM DV DATA
351
CHECKS TRANSFER CONTINUITY
352
YES
CONTROL PACKET?
NO
353
EXTRACTS BOTH CYCLE INFORMATION AND A TRANSMITTING MODE
354
STORES THE DV DATA IN A RECEIVING BUFFER
355
UPDATES A TIME STAMP
325
NO
NEW?
YES
326
EXTRACTS TYPE INFORMATION
327
UPDATES THE COUNTER VALUE OF A BLOCK COUNTER
END

FIG. 25A

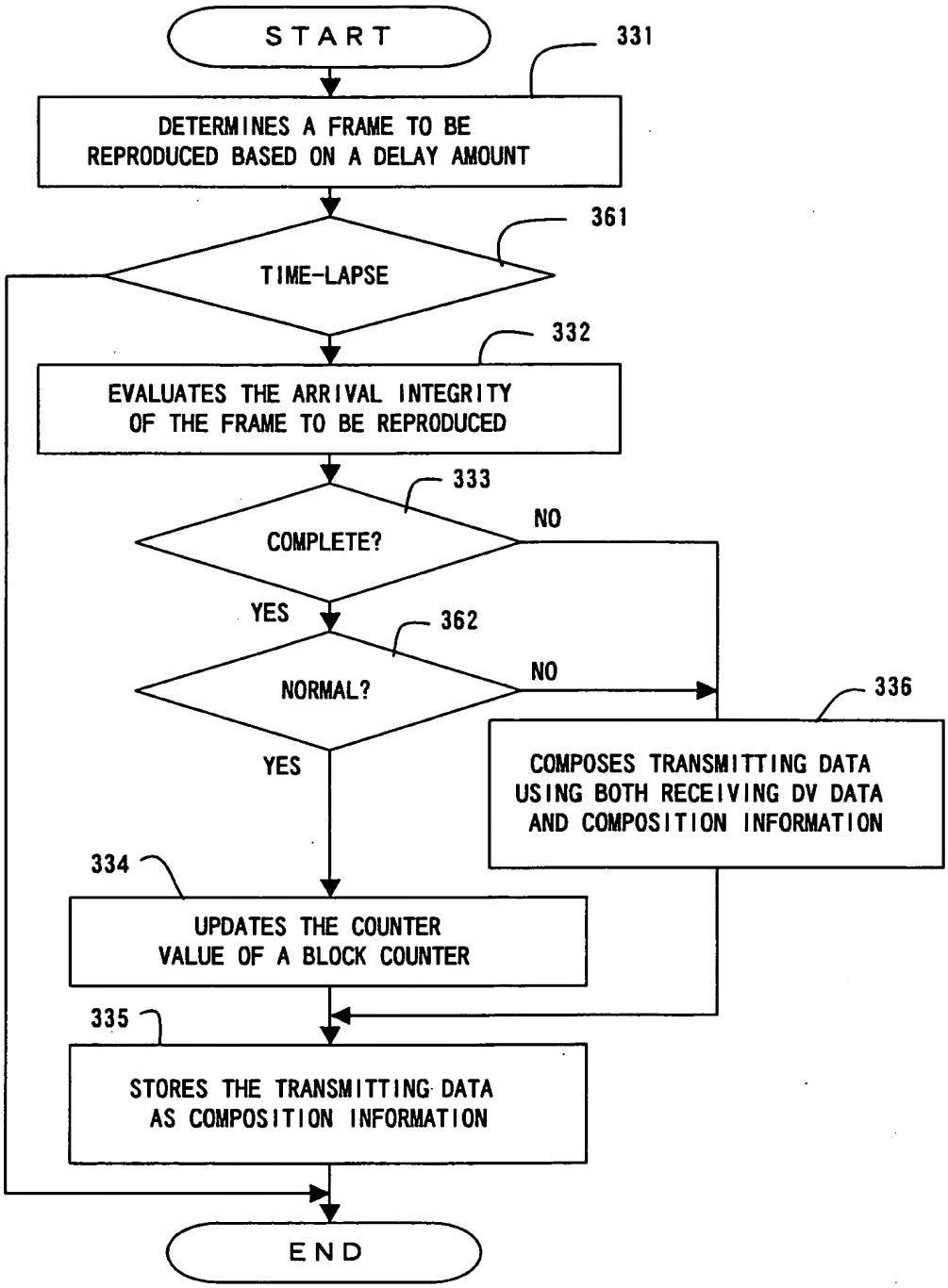

START
331
DETERMINES A FRAME TO BE REPRODUCED BASED ON A DELAY AMOUNT
361
TIME-LAPSE
332
EVALUATES THE ARRIVAL INTEGRITY OF THE FRAME TO BE REPRODUCED
333
COMPLETE?
NO
YES
362
NORMAL?
NO
336
YES
COMPOSES TRANSMITTING DATA USING BOTH RECEIVING DV DATA AND COMPOSITION INFORMATION
334
UPDATES THE COUNTER VALUE OF A BLOCK COUNTER
335
STORES THE TRANSMITTING DATA AS COMPOSITION INFORMATION
END

FIG. 25B

PACKET No.	ONLY VOICE	ONLY PICTURE
0	FH	FH
1	a v v v v v	– v v v v v
2	– – – – – –	v v v v v v
3	v v v v a v	v v v v – v
⋮	⋮	⋮
249	– – – – – –	v v v v v v

FIG. 26A

PACKET No.	FIRST BUFFER	SECOND BUFFER
0	FH_{n-1}	FH_n
1	$a_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$	a_n – – – – –
2	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$	– – – – – –
3	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ a_{n-1}\ v_{n-1}$	– – – – a_n –
⋮	⋮	⋮
249	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$	– – – – – –

FIG. 26B

PACKET No.	TRANSMITTING DATA
0	FH_{n-1}
1	$a_n\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$
2	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$
3	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ a_n\ v_{n-1}$
⋮	⋮
249	$v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}\ v_{n-1}$

FIG. 26C

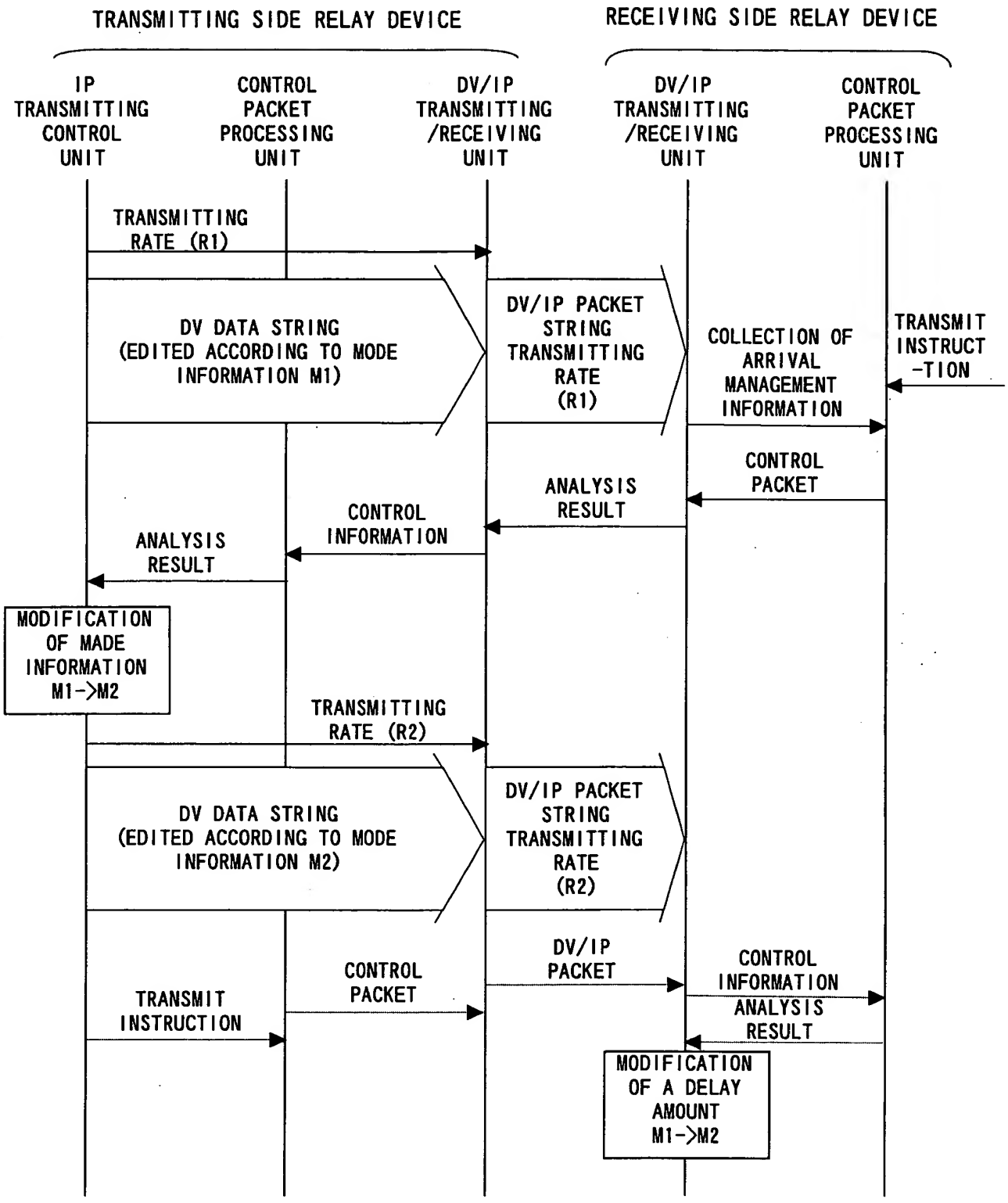

TRANSMITTING SIDE RELAY DEVICE
RECEIVING SIDE RELAY DEVICE
IP TRANSMITTING CONTROL UNIT
CONTROL PACKET PROCESSING UNIT
DV/IP TRANSMITTING /RECEIVING UNIT
DV/IP TRANSMITTING /RECEIVING UNIT
CONTROL PACKET PROCESSING UNIT
TRANSMITTING RATE (R1)
DV DATA STRING (EDITED ACCORDING TO MODE INFORMATION M1)
DV/IP PACKET STRING TRANSMITTING RATE (R1)
COLLECTION OF ARRIVAL MANAGEMENT INFORMATION
TRANSMIT INSTRUCT -TION
CONTROL PACKET
ANALYSIS RESULT
CONTROL INFORMATION
ANALYSIS RESULT
MODIFICATION OF MADE INFORMATION M1->M2
TRANSMITTING RATE (R2)
DV DATA STRING (EDITED ACCORDING TO MODE INFORMATION M2)
DV/IP PACKET STRING TRANSMITTING RATE (R2)
DV/IP PACKET
CONTROL INFORMATION
CONTROL PACKET
TRANSMIT INSTRUCTION
ANALYSIS RESULT
MODIFICATION OF A DELAY AMOUNT M1->M2

FIG. 27

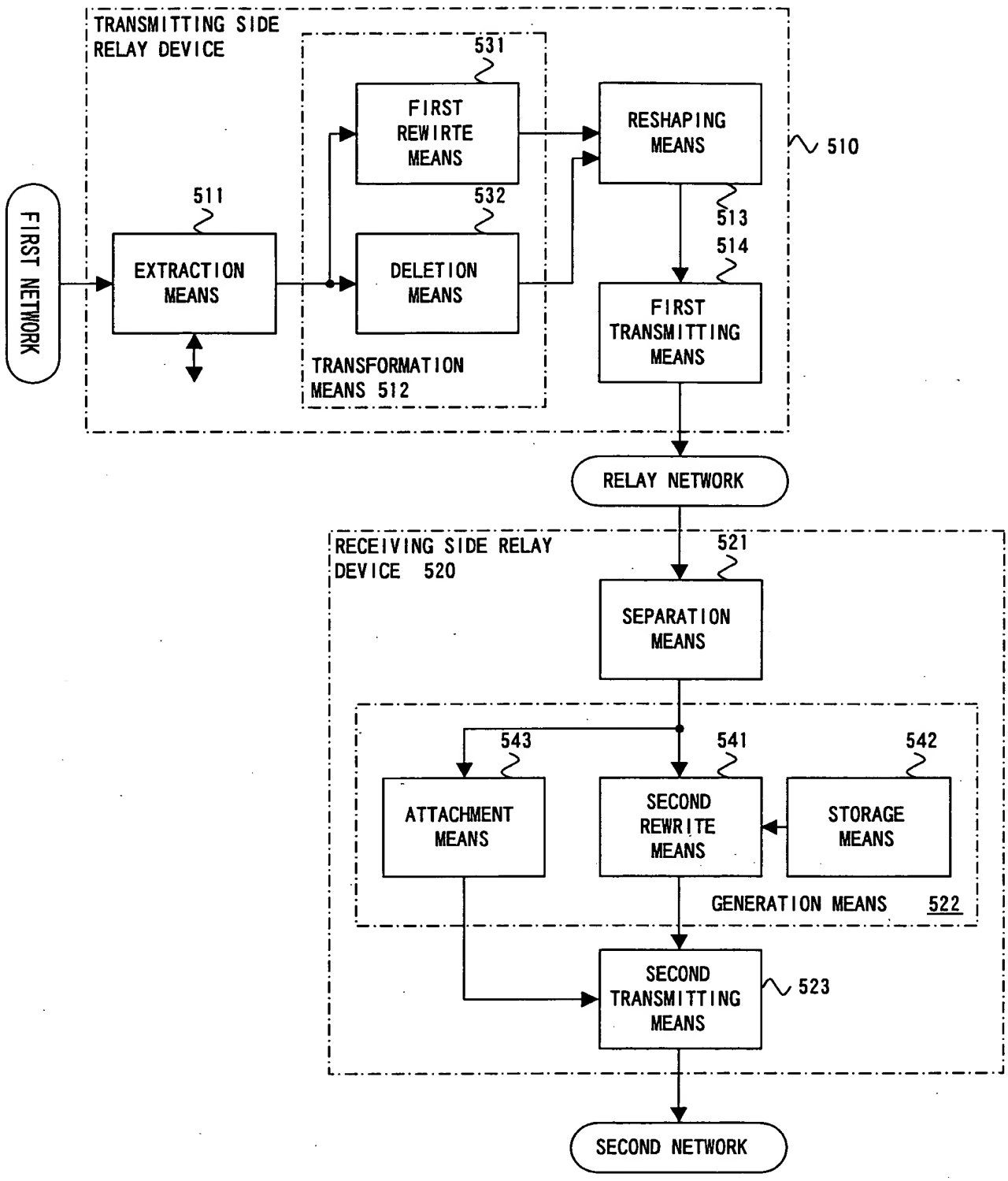

TRANSMITTING SIDE
RELAY DEVICE
531
FIRST
REWIRTE
MEANS
RESHAPING
MEANS
510
FIRST NETWORK
511
532
513
514
EXTRACTION
MEANS
DELETION
MEANS
FIRST
TRANSMITTING
MEANS
TRANSFORMATION
MEANS 512
RELAY NETWORK
RECEIVING SIDE RELAY
DEVICE 520
521
SEPARATION
MEANS
543
541
542
ATTACHMENT
MEANS
SECOND
REWRITE
MEANS
STORAGE
MEANS
GENERATION MEANS 522
SECOND
TRANSMITTING
MEANS
523
SECOND NETWORK

FIG. 28

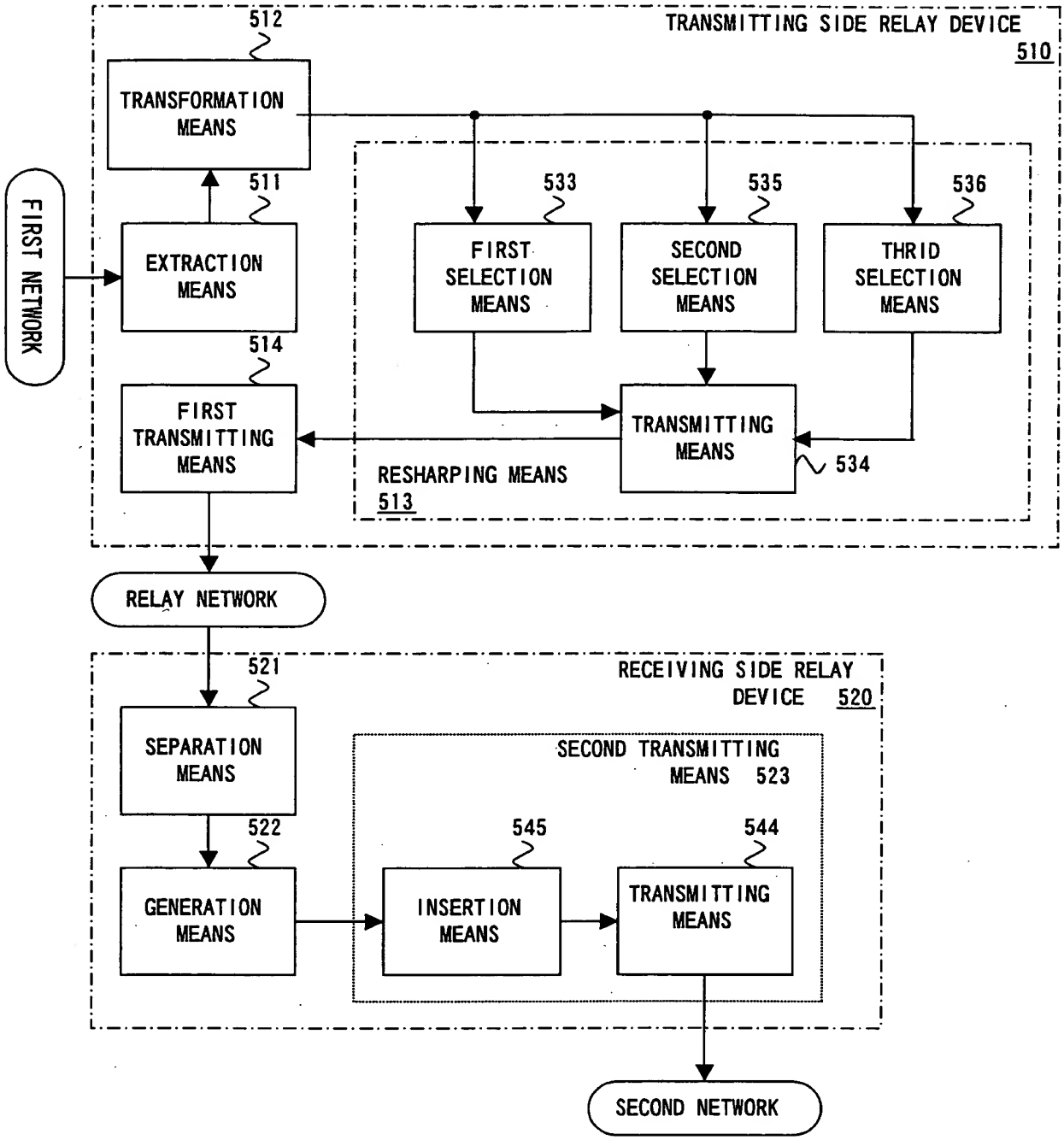

TRANSMITTING SIDE RELAY DEVICE
510
512
TRANSFORMATION MEANS
511
EXTRACTION MEANS
FIRST NETWORK
514
FIRST TRANSMITTING MEANS
533
FIRST SELECTION MEANS
535
SECOND SELECTION MEANS
536
THRID SELECTION MEANS
TRANSMITTING MEANS
534
RESHARPING MEANS
513
RELAY NETWORK
RECEIVING SIDE RELAY DEVICE
520
521
SEPARATION MEANS
522
GENERATION MEANS
SECOND TRANSMITTING MEANS
523
545
INSERTION MEANS
544
TRANSMITTING MEANS
SECOND NETWORK

FIG. 29

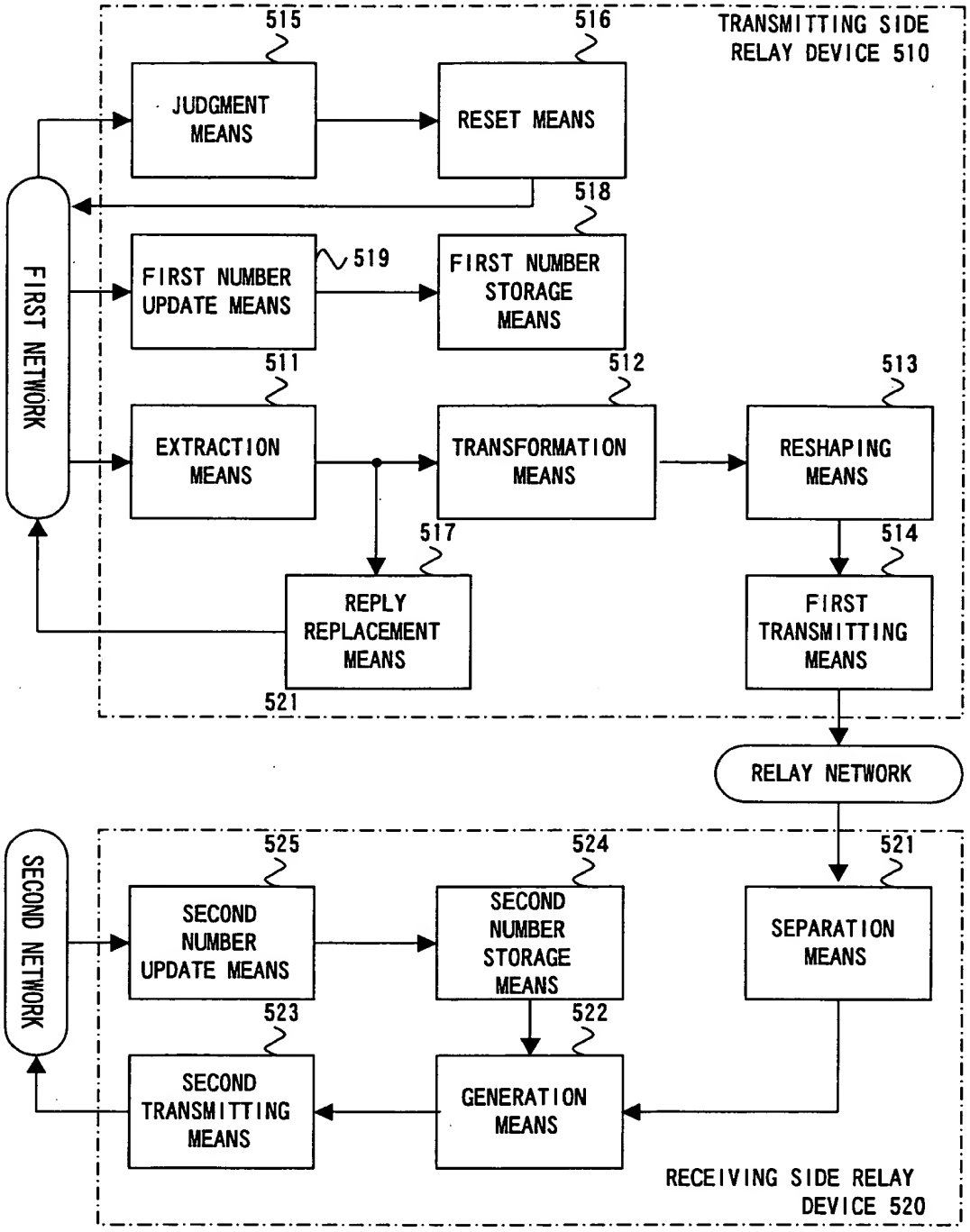

TRANSMITTING SIDE RELAY DEVICE 510
515
JUDGMENT MEANS
516
RESET MEANS
518
FIRST NETWORK
519
FIRST NUMBER UPDATE MEANS
FIRST NUMBER STORAGE MEANS
511
EXTRACTION MEANS
512
TRANSFORMATION MEANS
513
RESHAPING MEANS
517
REPLY REPLACEMENT MEANS
514
FIRST TRANSMITTING MEANS
521
RELAY NETWORK
SECOND NETWORK
525
SECOND NUMBER UPDATE MEANS
524
SECOND NUMBER STORAGE MEANS
521
SEPARATION MEANS
523
SECOND TRANSMITTING MEANS
522
GENERATION MEANS
RECEIVING SIDE RELAY DEVICE 520

FIG. 30

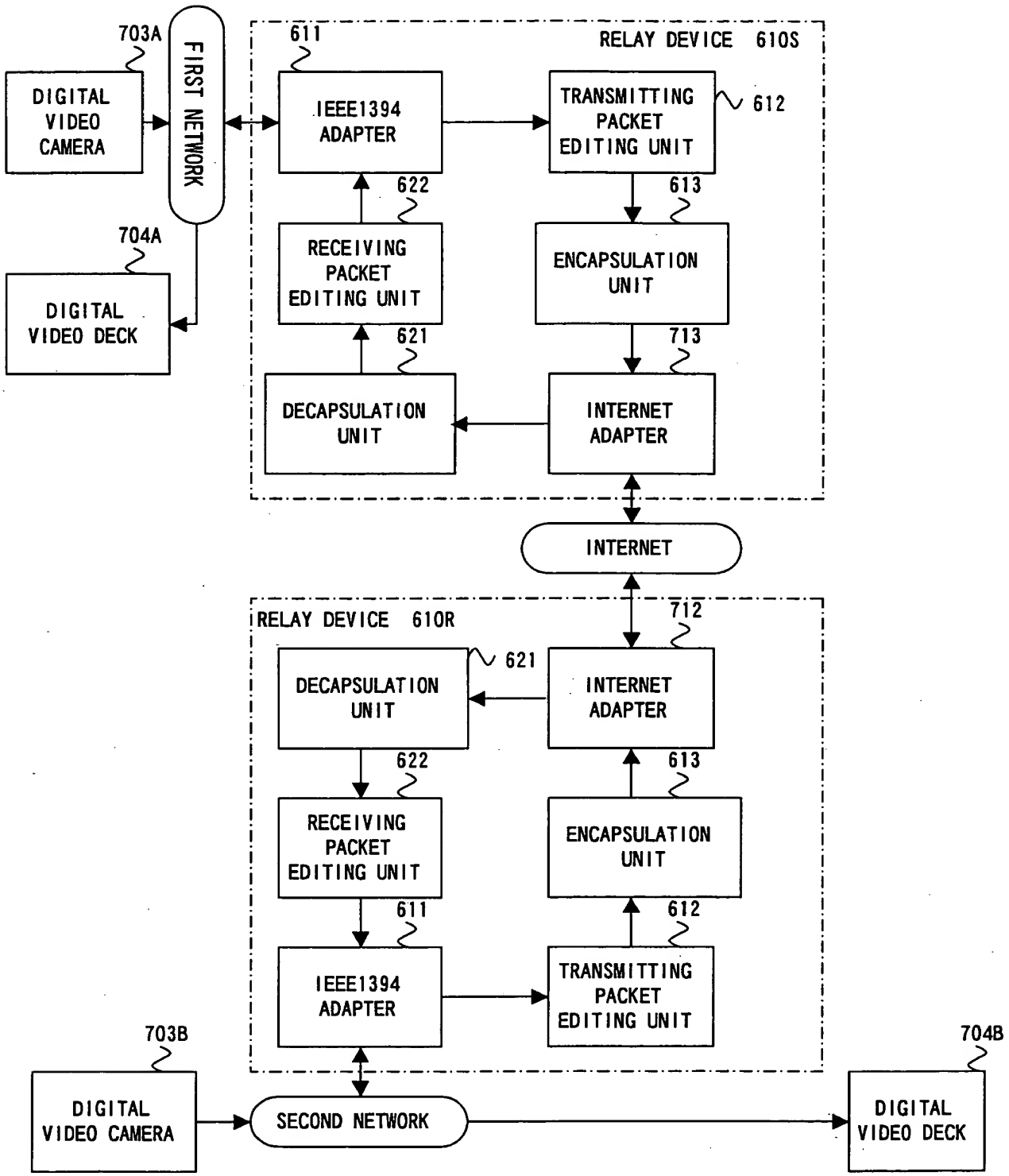

703A
DIGITAL VIDEO CAMERA
FIRST NETWORK
704A
DIGITAL VIDEO DECK
611
IEEE1394 ADAPTER
RELAY DEVICE 610S
TRANSMITTING PACKET EDITING UNIT
612
622
RECEIVING PACKET EDITING UNIT
613
ENCAPSULATION UNIT
621
DECAPSULATION UNIT
713
INTERNET ADAPTER
INTERNET
RELAY DEVICE 610R
712
621
DECAPSULATION UNIT
INTERNET ADAPTER
622
613
RECEIVING PACKET EDITING UNIT
ENCAPSULATION UNIT
611
612
IEEE1394 ADAPTER
TRANSMITTING PACKET EDITING UNIT
703B
704B
DIGITAL VIDEO CAMERA
SECOND NETWORK
DIGITAL VIDEO DECK

FIG. 31

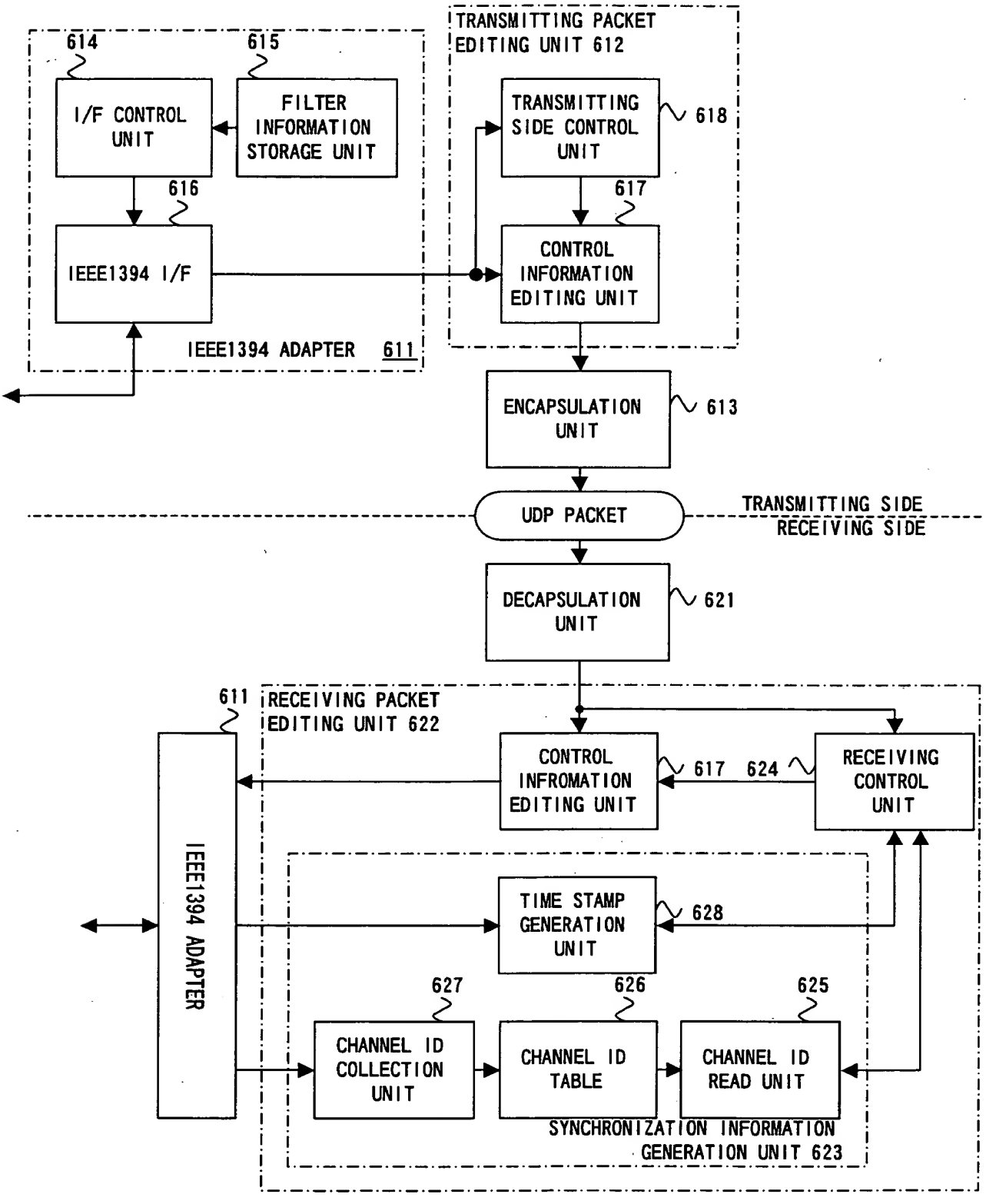

TRANSMITTING PACKET EDITING UNIT 612
614
615
I/F CONTROL UNIT
FILTER INFORMATION STORAGE UNIT
TRANSMITTING SIDE CONTROL UNIT
618
616
617
IEEE1394 I/F
CONTROL INFORMATION EDITING UNIT
IEEE1394 ADAPTER 611
ENCAPSULATION UNIT
613
UDP PACKET
TRANSMITTING SIDE
RECEIVING SIDE
DECAPSULATION UNIT
621
611
RECEIVING PACKET EDITING UNIT 622
CONTROL INFROMATION EDITING UNIT
617
624
RECEIVING CONTROL UNIT
IEEE1394 ADAPTER
TIME STAMP GENERATION UNIT
628
627
626
625
CHANNEL ID COLLECTION UNIT
CHANNEL ID TABLE
CHANNEL ID READ UNIT
SYNCHRONIZATION INFORMATION GENERATION UNIT 623

FIG. 32

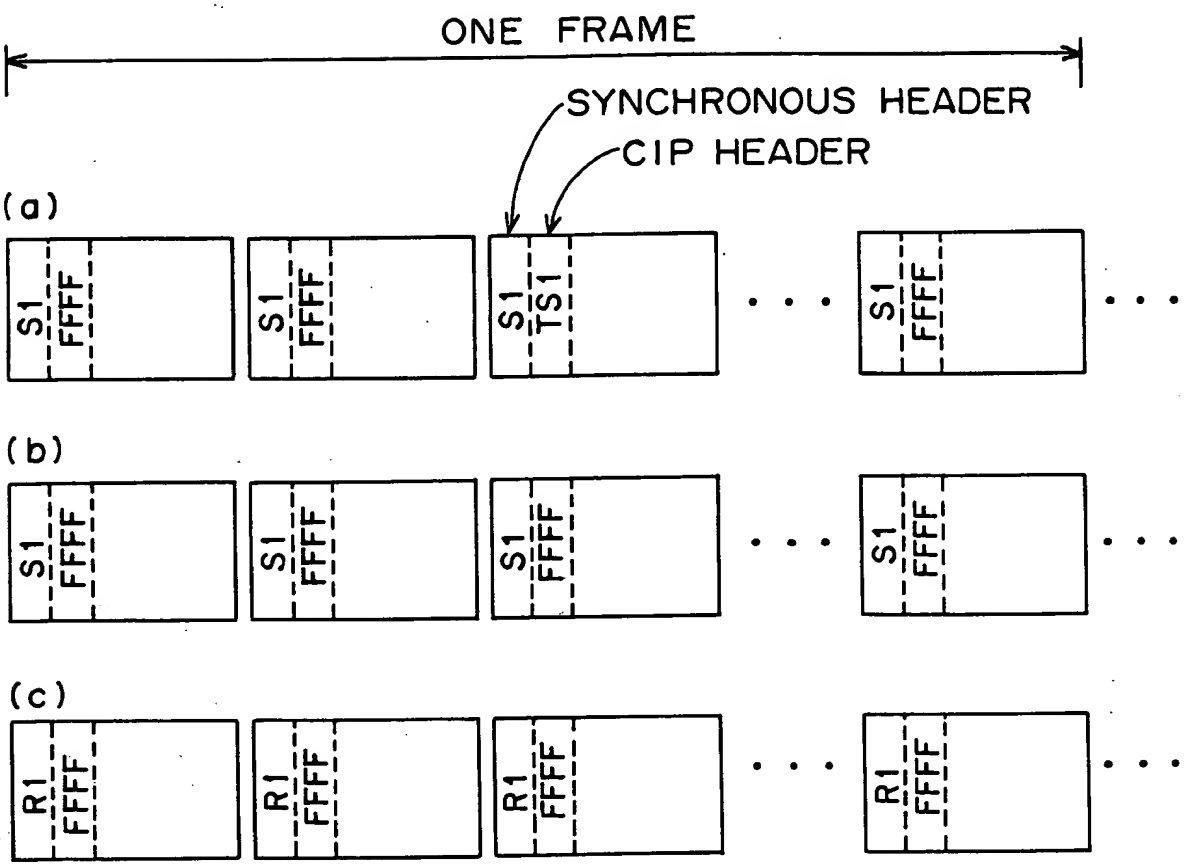

ONE FRAME
SYNCHRONOUS HEADER
CIP HEADER
(a)
S1
FFFF
S1
FFFF
S1
TS1
S1
FFFF
(b)
S1
FFFF
S1
FFFF
S1
FFFF
S1
FFFF
(c)
R1
FFFF
R1
FFFF
R1
FFFF
R1
FFFF

FIG. 33

TRANSMITTING SIDE CHANNEL ID	RECEIVING SIDE CHANNEL ID
S 1	R 1
.	.
.	.
.	.

FIG. 34A

TRANSMITTING SIDE CHANNEL ID	NETWORK ADDRESS	RECEIVING SIDE CHANNEL ID
S 1	N 1	R 1
S 1	N 2	R 2
S 2	N 1	R 3
.	.	.
.	.	.
.	.	.

FIG. 34B

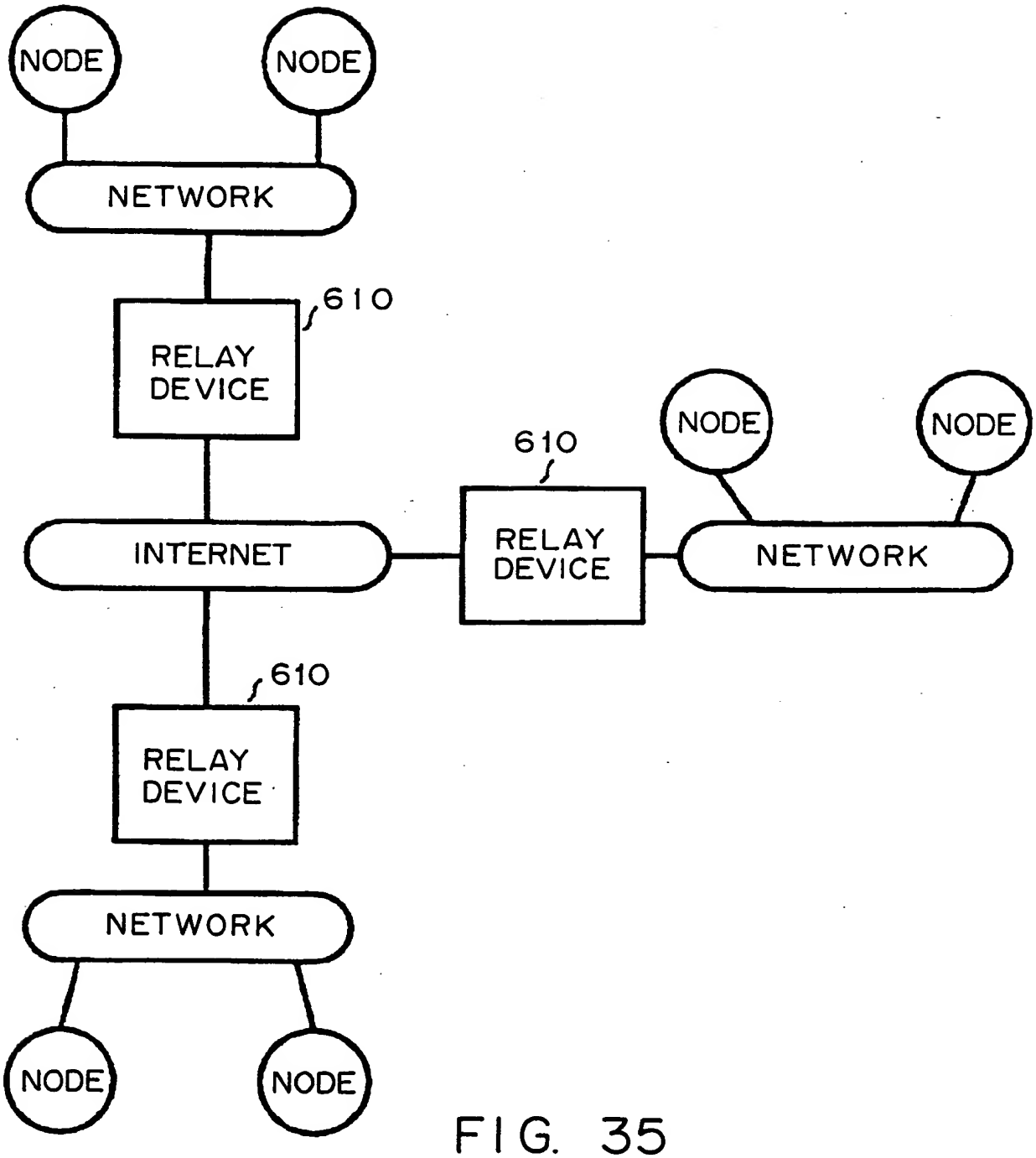

NODE
NODE
NETWORK
610
RELAY DEVICE
NODE
NODE
610
INTERNET
RELAY DEVICE
NETWORK
610
RELAY DEVICE
NETWORK
NODE
NODE

FIG. 35

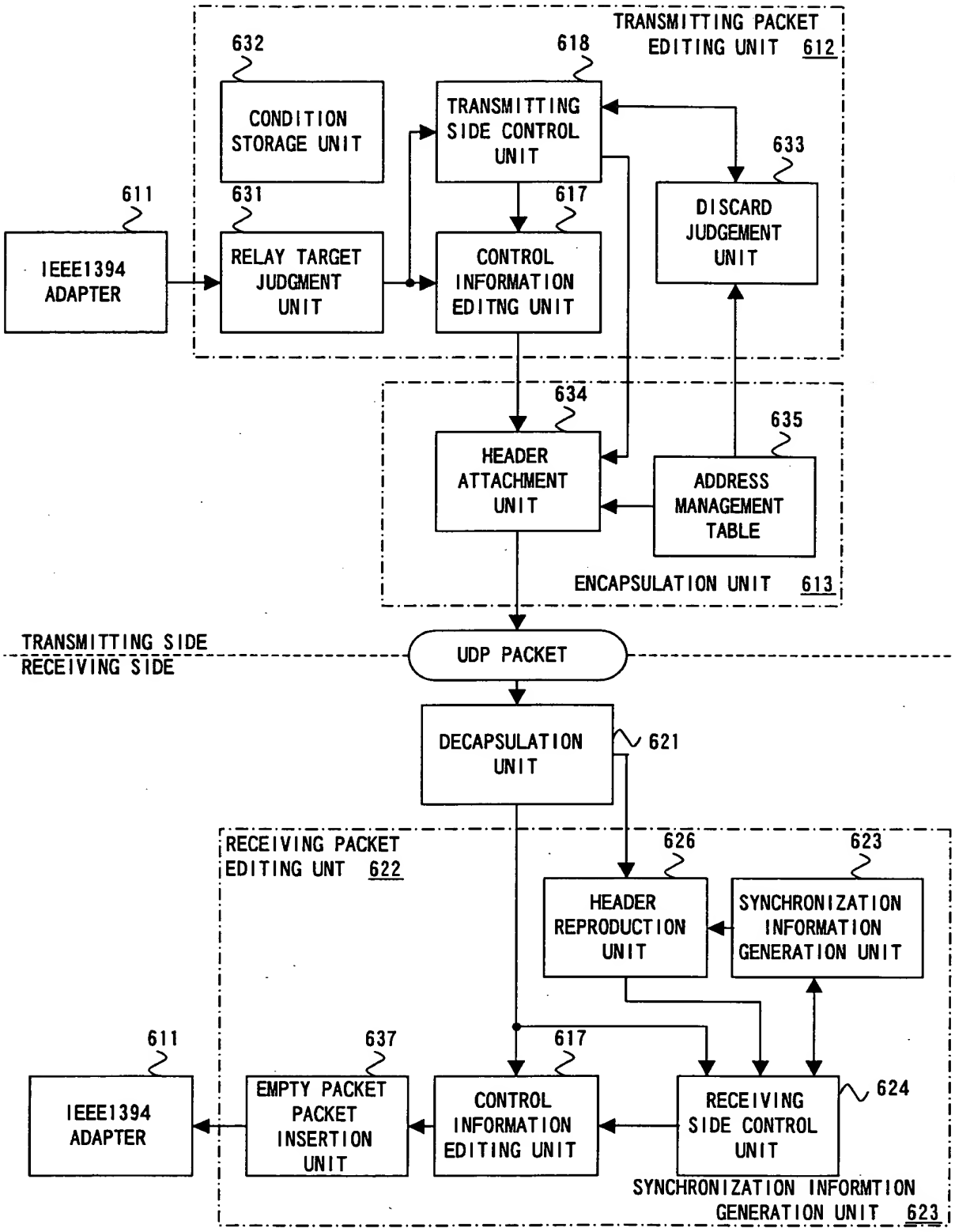

TRANSMITTING PACKET EDITING UNIT 612
632
CONDITION STORAGE UNIT
618
TRANSMITTING SIDE CONTROL UNIT
633
DISCARD JUDGEMENT UNIT
611
IEEE1394 ADAPTER
631
RELAY TARGET JUDGMENT UNIT
617
CONTROL INFORMATION EDITNG UNIT
634
HEADER ATTACHMENT UNIT
635
ADDRESS MANAGEMENT TABLE
ENCAPSULATION UNIT 613
TRANSMITTING SIDE
RECEIVING SIDE
UDP PACKET
DECAPSULATION UNIT
621
RECEIVING PACKET EDITING UNT 622
626
HEADER REPRODUCTION UNIT
623
SYNCHRONIZATION INFORMATION GENERATION UNIT
611
IEEE1394 ADAPTER
637
EMPTY PACKET PACKET INSERTION UNIT
617
CONTROL INFORMATION EDITING UNIT
624
RECEIVING SIDE CONTROL UNIT
SYNCHRONIZATION INFORMTION GENERATION UNIT 623

FIG. 36

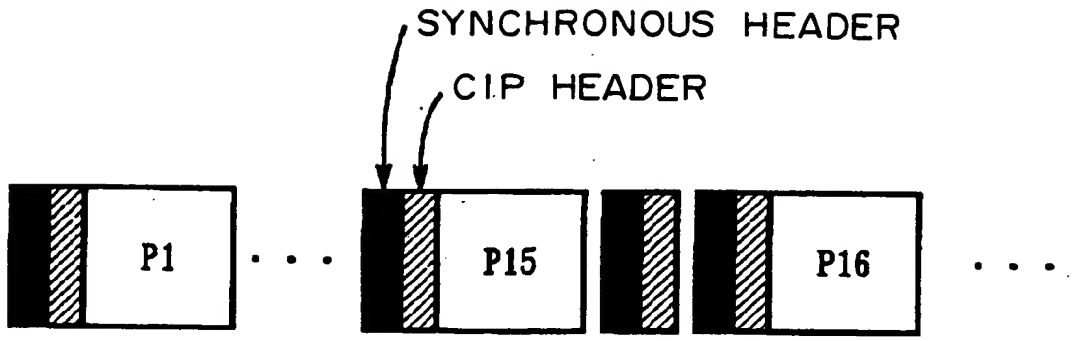


FIG. 37A

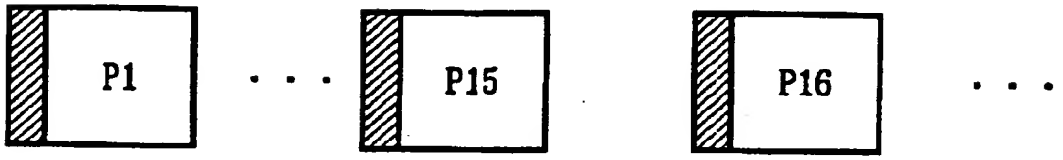


FIG. 37B

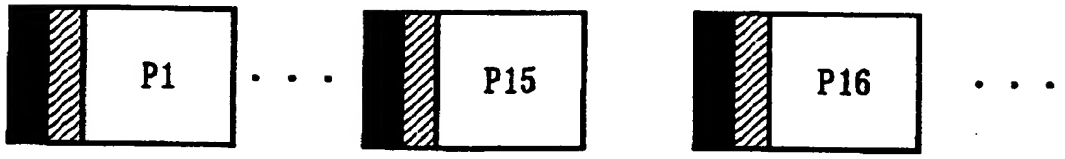


FIG. 37C

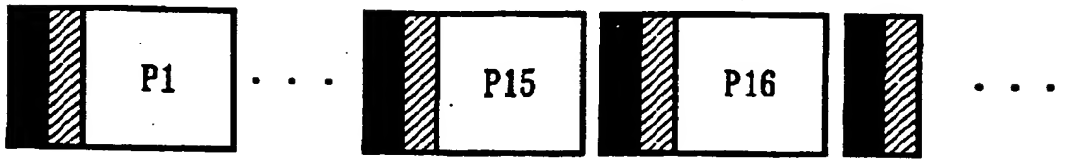


FIG. 37D

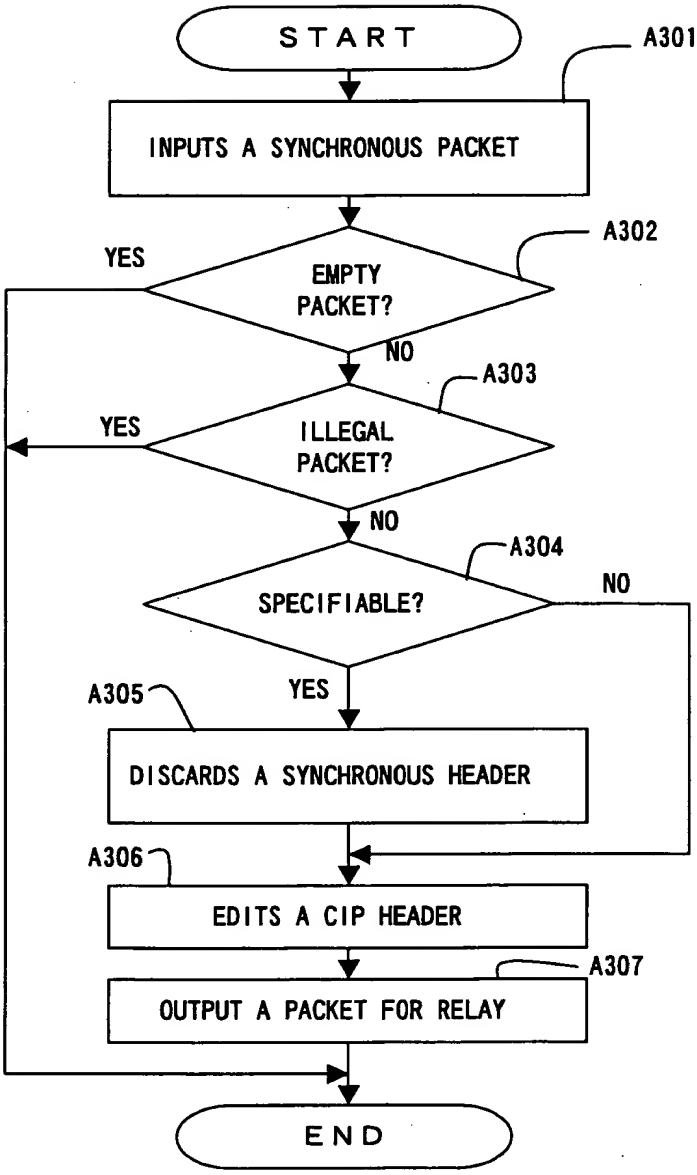

START
A301
INPUTS A SYNCHRONOUS PACKET
A302
YES
EMPTY PACKET?
NO
A303
YES
ILLEGAL PACKET?
NO
A304
SPECIFIABLE?
NO
YES
A305
DISCARDS A SYNCHRONOUS HEADER
A306
EDITS A CIP HEADER
A307
OUTPUT A PACKET FOR RELAY
END

FIG. 38

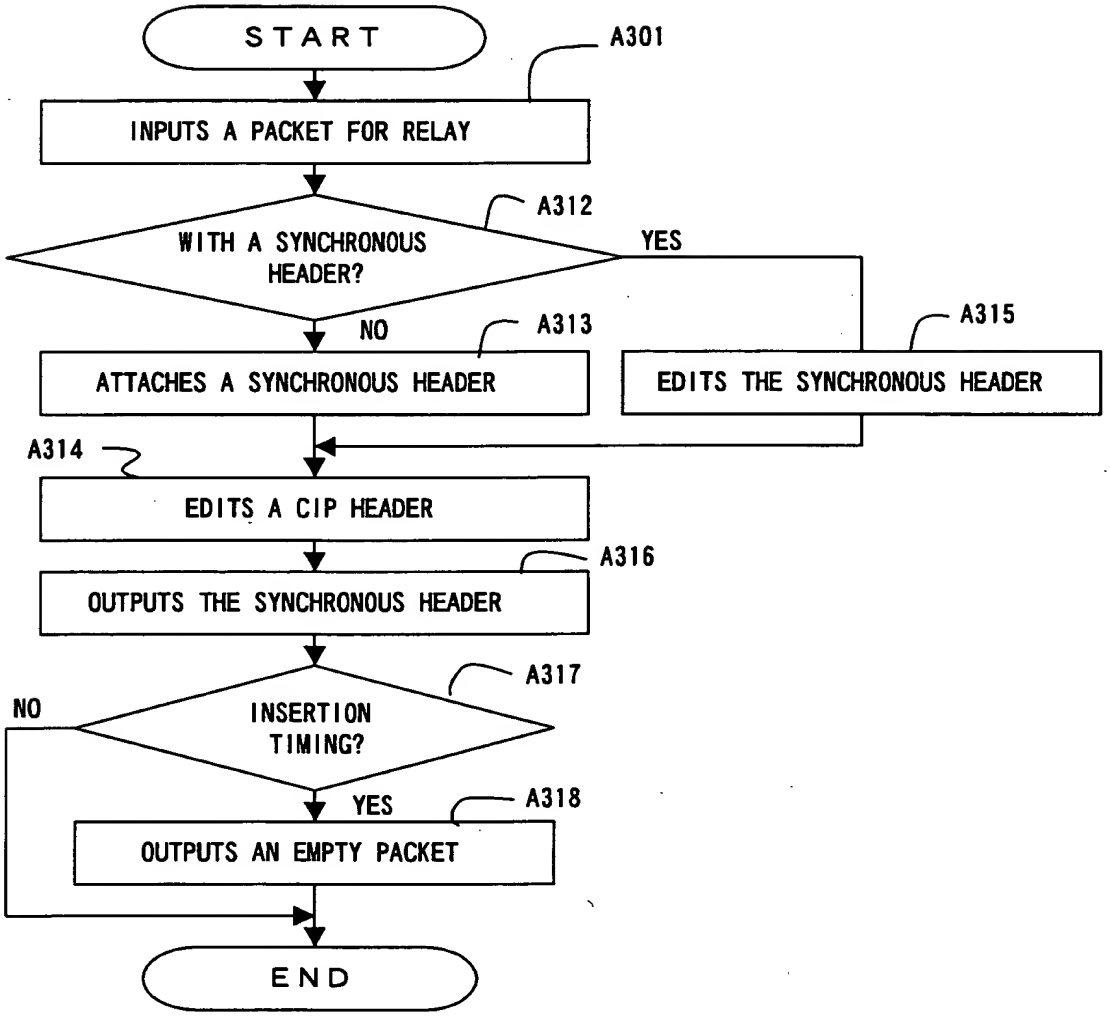

START
A301
INPUTS A PACKET FOR RELAY
A312
WITH A SYNCHRONOUS HEADER?
YES
NO
A313
ATTACHES A SYNCHRONOUS HEADER
A315
EDITS THE SYNCHRONOUS HEADER
A314
EDITS A CIP HEADER
A316
OUTPUTS THE SYNCHRONOUS HEADER
A317
NO
INSERTION TIMING?
YES
A318
OUTPUTS AN EMPTY PACKET
END

FIG. 39

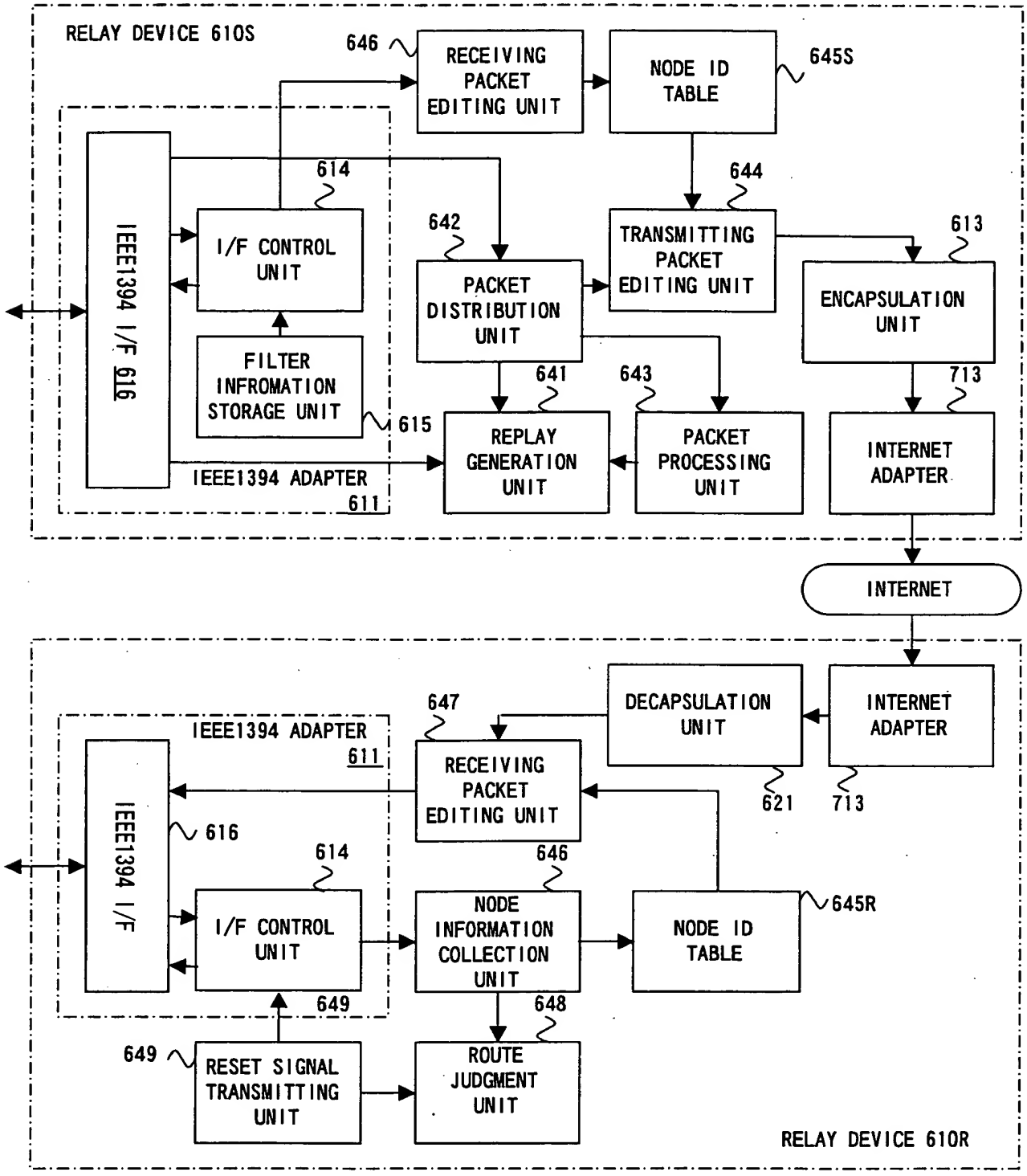

RELAY DEVICE 610S
646
RECEIVING PACKET EDITING UNIT
NODE ID TABLE
645S
614
644
642
613
IEEE1394 I/F 616
I/F CONTROL UNIT
PACKET DISTRIBUTION UNIT
TRANSMITTING PACKET EDITING UNIT
ENCAPSULATION UNIT
FILTER INFROMATION STORAGE UNIT
641
643
713
615
REPLAY GENERATION UNIT
PACKET PROCESSING UNIT
INTERNET ADAPTER
IEEE1394 ADAPTER 611
INTERNET
DECAPSULATION UNIT
INTERNET ADAPTER
647
IEEE1394 ADAPTER 611
RECEIVING PACKET EDITING UNIT
621
713
616
614
646
IEEE1394 I/F
I/F CONTROL UNIT
NODE INFORMATION COLLECTION UNIT
NODE ID TABLE
645R
649
648
649
RESET SIGNAL TRANSMITTING UNIT
ROUTE JUDGMENT UNIT
RELAY DEVICE 610R

FIG. 40

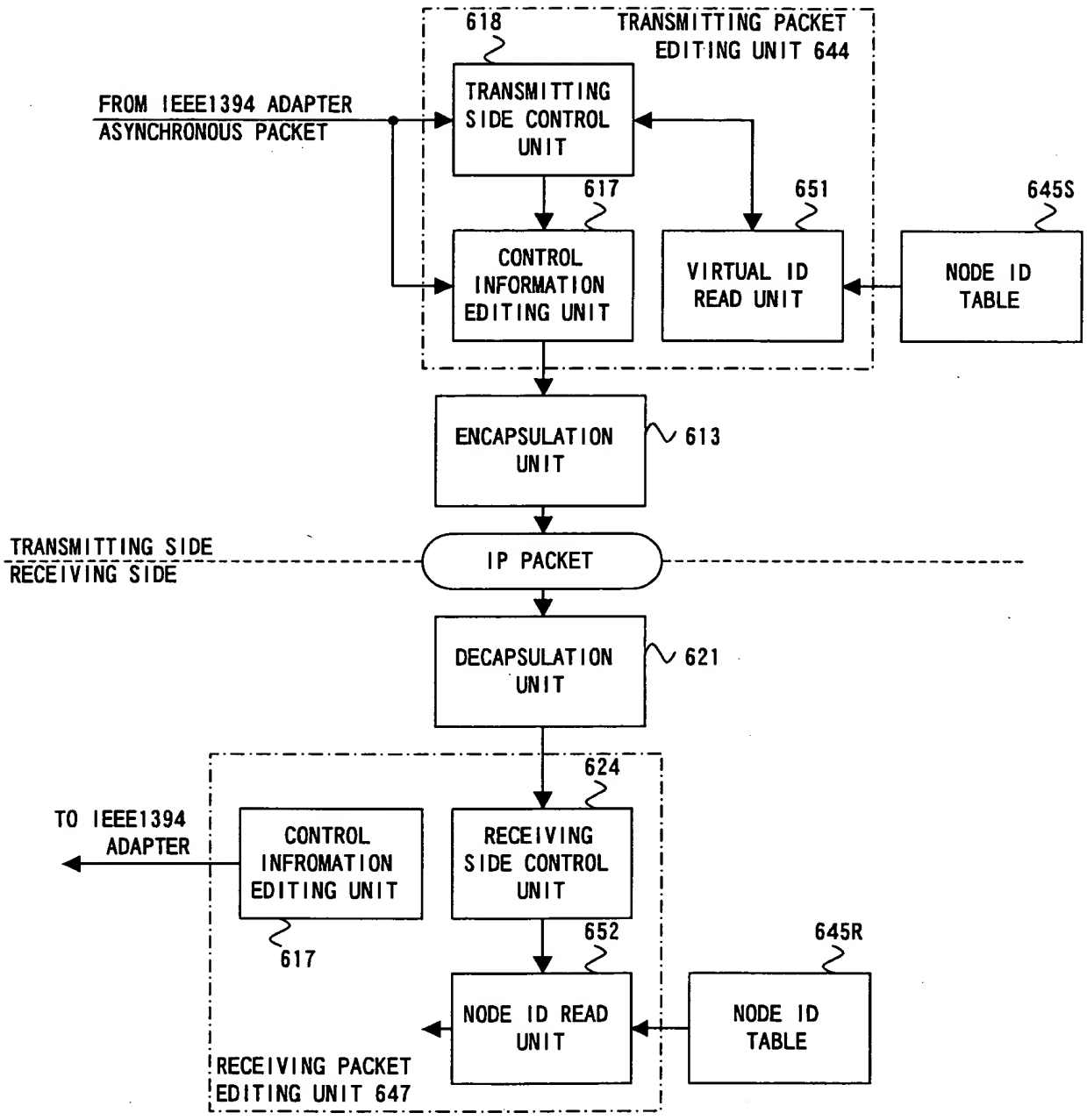

618
TRANSMITTING PACKET EDITING UNIT 644
FROM IEEE1394 ADAPTER ASYNCHRONOUS PACKET
TRANSMITTING SIDE CONTROL UNIT
617
651
645S
CONTROL INFORMATION EDITING UNIT
VIRTUAL ID READ UNIT
NODE ID TABLE
ENCAPSULATION UNIT
613
TRANSMITTING SIDE
RECEIVING SIDE
IP PACKET
DECAPSULATION UNIT
621
624
TO IEEE1394 ADAPTER
CONTROL INFROMATION EDITING UNIT
RECEIVING SIDE CONTROL UNIT
617
652
645R
NODE ID READ UNIT
NODE ID TABLE
RECEIVING PACKET EDITING UNIT 647

FIG. 41

FIG. 42A

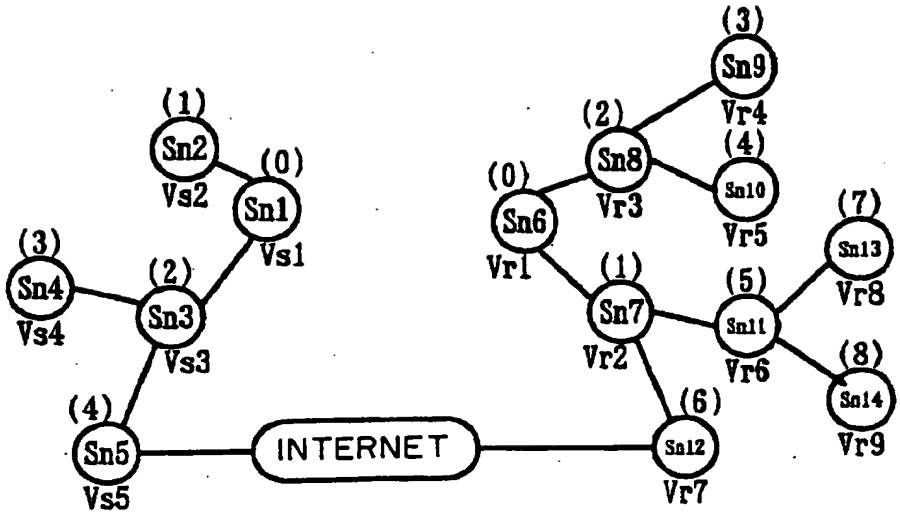


FIG. 42B

SERIAL No.	VIRTUAL ID	NODE ID
Sn1	Vs1	0
Sn2	Vs2	1
.	.	.
.	.	.
.	.	.
Sn5	Vs5	4

FIG. 42C

SERIAL No.	VIRTUAL ID	NODE ID
Sn6	Vr1	0
Sn7	Vr2	1
.	.	.
.	.	.
.	.	.
Sn14	Vr9	8

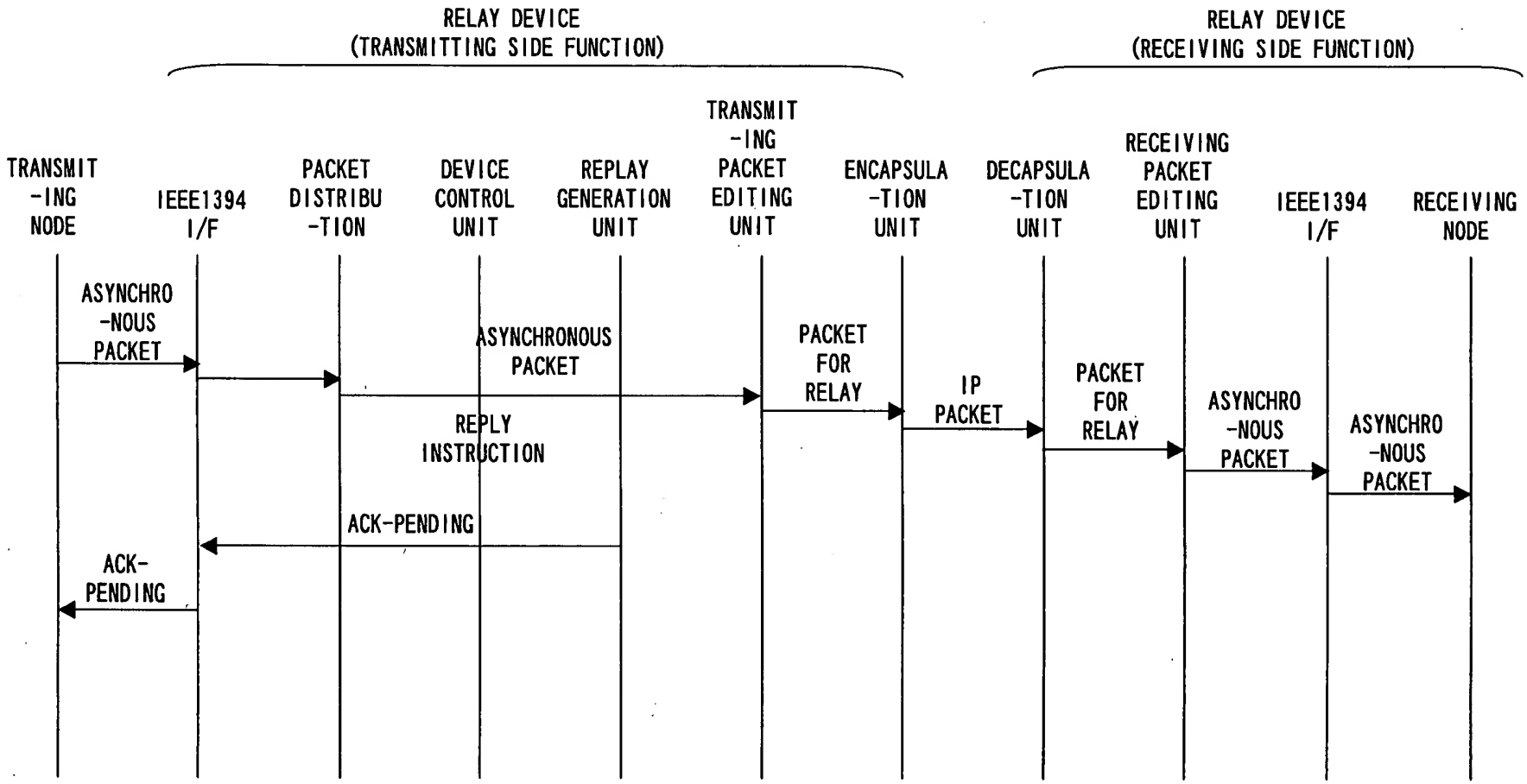

RELAY DEVICE
(TRANSMITTING SIDE FUNCTION)
RELAY DEVICE
(RECEIVING SIDE FUNCTION)
TRANSMIT -ING NODE
IEEE1394 I/F
PACKET DISTRIBU -TION
DEVICE CONTROL UNIT
REPLAY GENERATION UNIT
TRANSMIT -ING PACKET EDITING UNIT
ENCAPSULA -TION UNIT
DECAPSULA -TION UNIT
RECEIVING PACKET EDITING UNIT
IEEE1394 I/F
RECEIVING NODE
ASYNCHRO -NOUS PACKET
ASYNCHRONOUS PACKET
PACKET FOR RELAY
IP PACKET
PACKET FOR RELAY
ASYNCHRO -NOUS PACKET
ASYNCHRO -NOUS PACKET
REPLY INSTRUCTION
ACK-PENDING
ACK-PENDING

FIG. 43

FIG. 44A

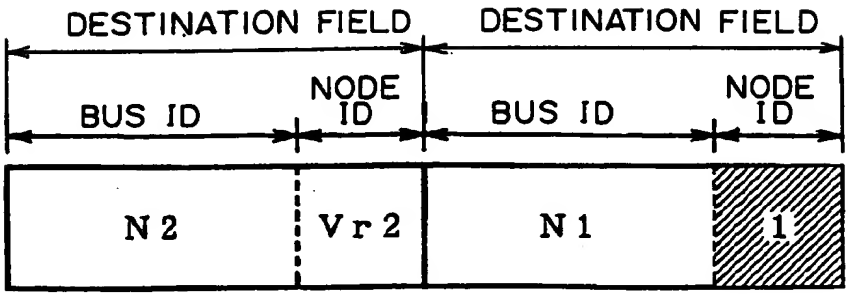


FIG. 44B

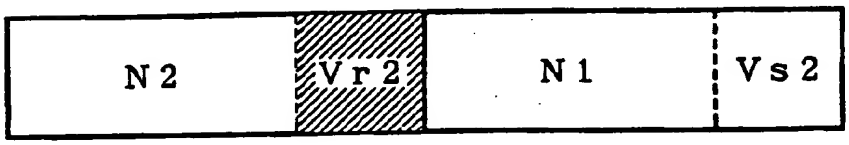
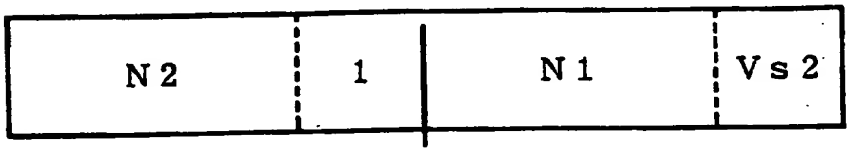


FIG. 44C



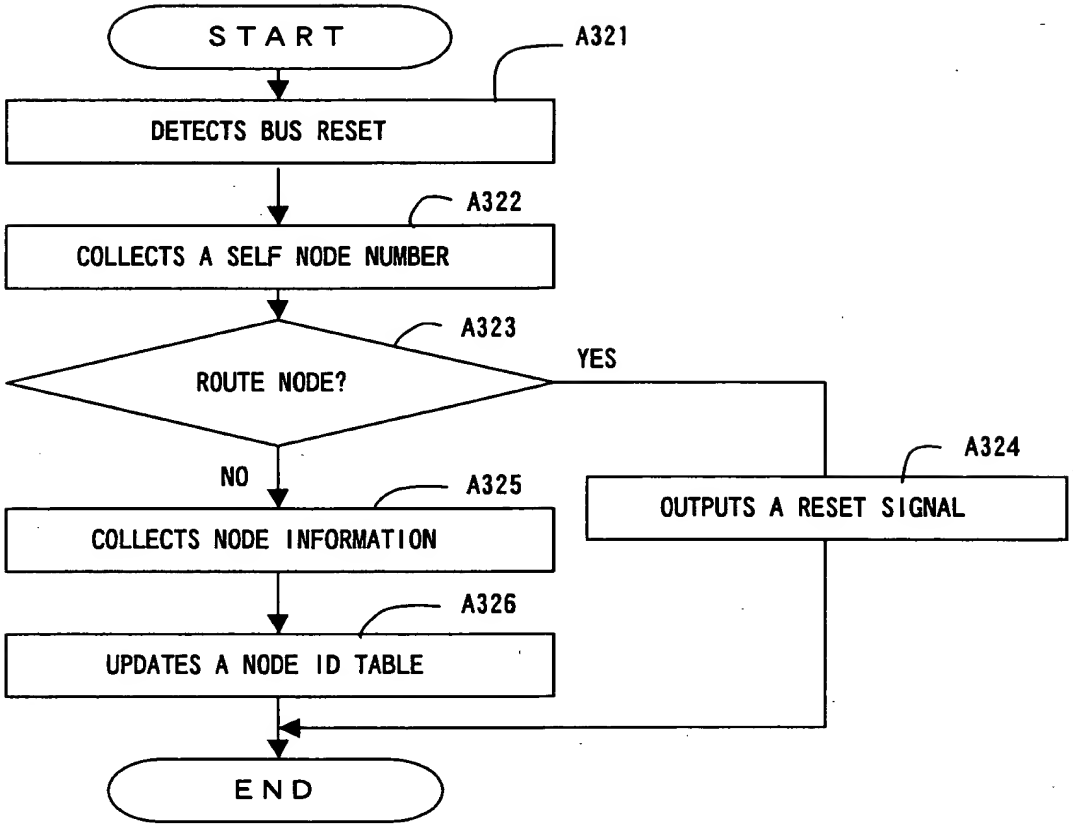

START
A321
DETECTS BUS RESET
A322
COLLECTS A SELF NODE NUMBER
A323
ROUTE NODE?
YES
NO
A324
OUTPUTS A RESET SIGNAL
A325
COLLECTS NODE INFORMATION
A326
UPDATES A NODE ID TABLE
END

FIG. 45

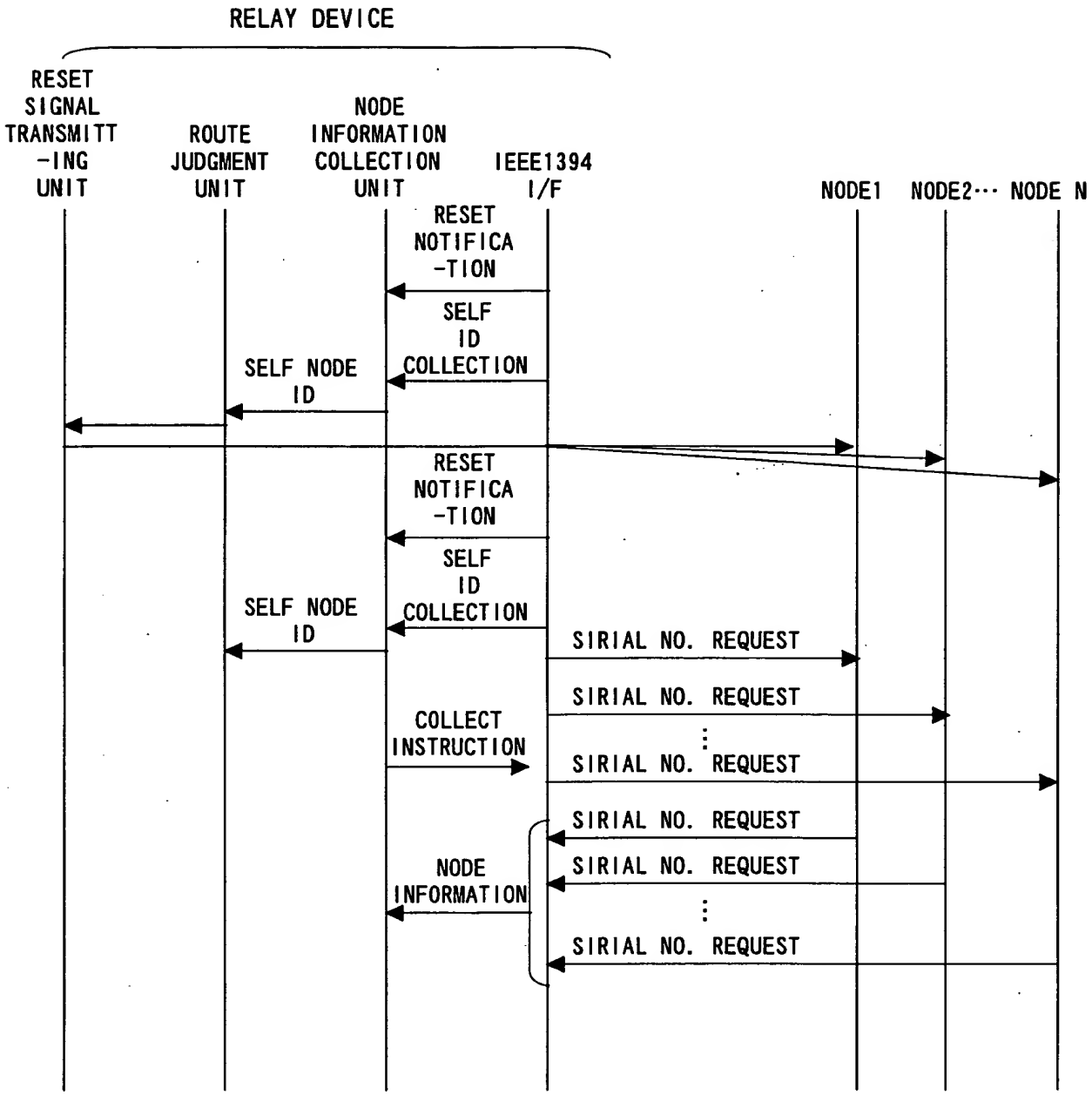

RELAY DEVICE
RESET SIGNAL TRANSMITT -ING UNIT
ROUTE JUDGMENT UNIT
NODE INFORMATION COLLECTION UNIT
IEEE1394 I/F
NODE1
NODE2··· NODE N
RESET NOTIFICA -TION
SELF ID COLLECTION
SELF NODE ID
RESET NOTIFICA -TION
SELF ID COLLECTION
SELF NODE ID
SIRIAL NO. REQUEST
SIRIAL NO. REQUEST
COLLECT INSTRUCTION
SIRIAL NO. REQUEST
SIRIAL NO. REQUEST
SIRIAL NO. REQUEST
NODE INFORMATION
SIRIAL NO. REQUEST

FIG. 46

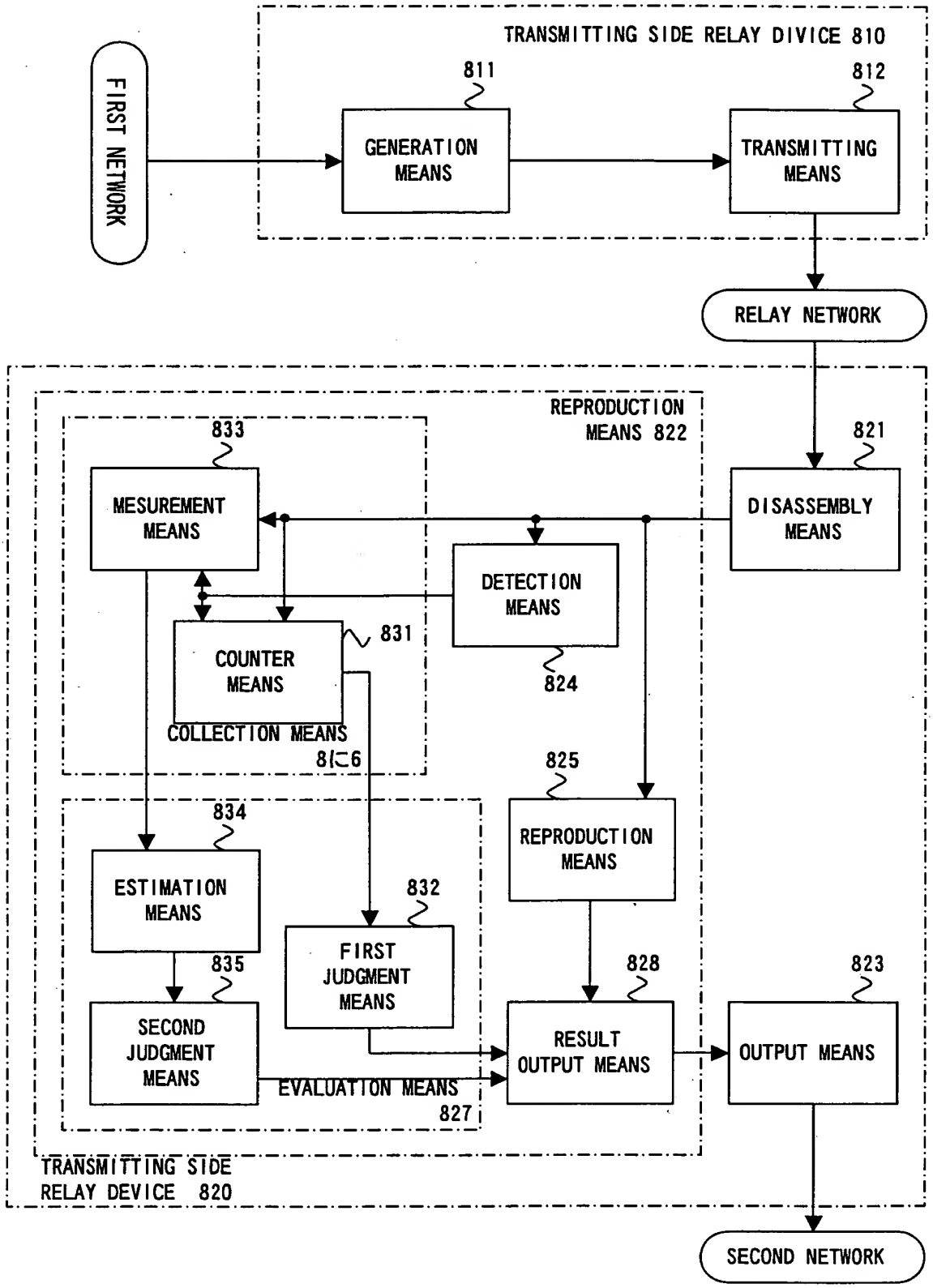

TRANSMITTING SIDE RELAY DIVICE 810
811
812
FIRST NETWORK
GENERATION MEANS
TRANSMITTING MEANS
RELAY NETWORK
REPRODUCTION MEANS 822
833
821
MESUREMENT MEANS
DISASSEMBLY MEANS
DETECTION MEANS
831
COUNTER MEANS
824
COLLECTION MEANS 816
825
834
REPRODUCTION MEANS
ESTIMATION MEANS
832
FIRST JUDGMENT MEANS
835
828
823
SECOND JUDGMENT MEANS
RESULT OUTPUT MEANS
OUTPUT MEANS
EVALUATION MEANS 827
TRANSMITTING SIDE RELAY DEVICE 820
SECOND NETWORK

FIG. 47

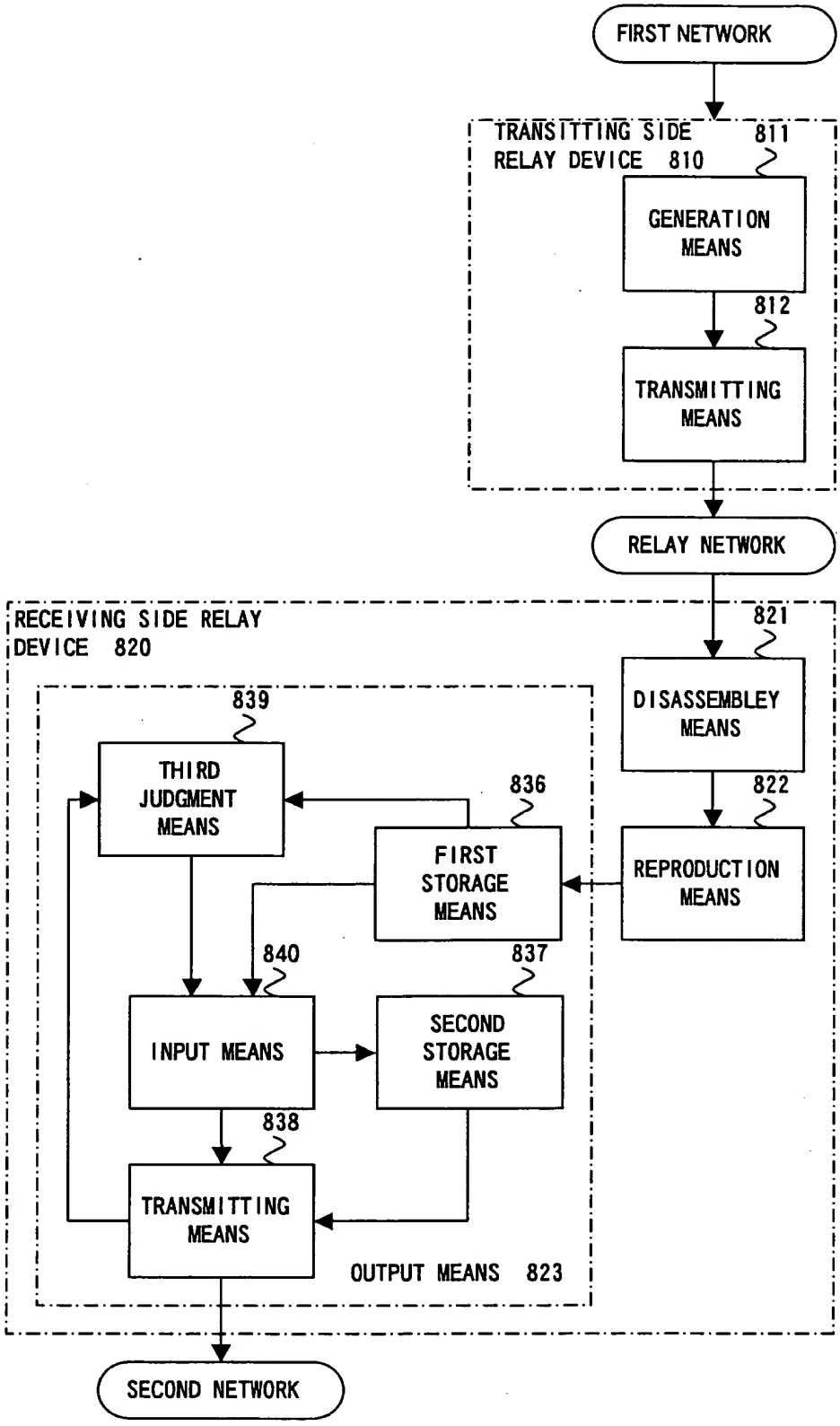

FIRST NETWORK
TRANSITTING SIDE RELAY DEVICE 810
811
GENERATION MEANS
812
TRANSMITTING MEANS
RELAY NETWORK
RECEIVING SIDE RELAY DEVICE 820
821
DISASSEMBLEY MEANS
822
REPRODUCTION MEANS
836
FIRST STORAGE MEANS
839
THIRD JUDGMENT MEANS
840
INPUT MEANS
837
SECOND STORAGE MEANS
838
TRANSMITTING MEANS
OUTPUT MEANS 823
SECOND NETWORK

FIG. 48

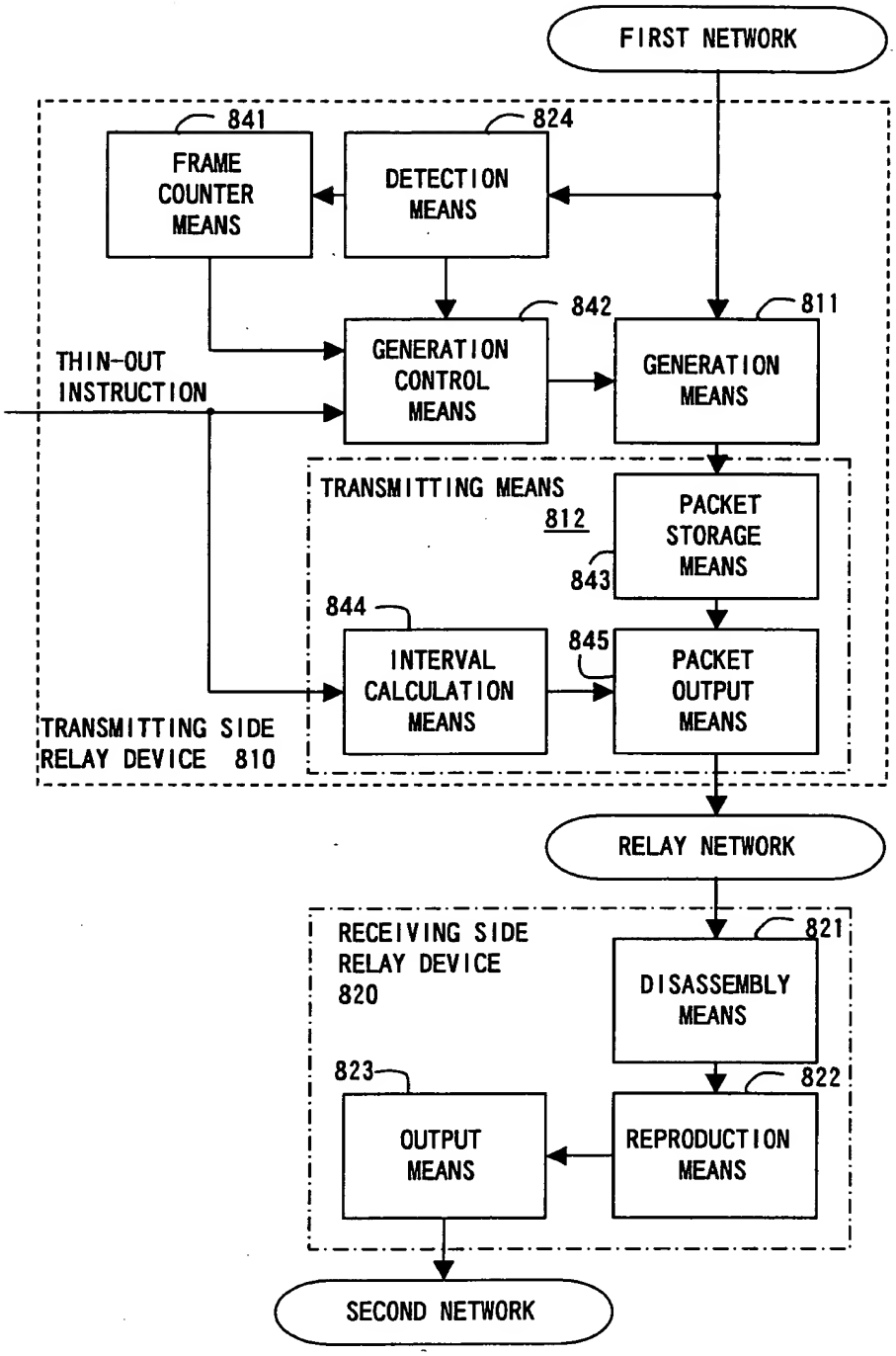

FIRST NETWORK
841
FRAME COUNTER MEANS
824
DETECTION MEANS
842
GENERATION CONTROL MEANS
811
GENERATION MEANS
THIN-OUT INSTRUCTION
TRANSMITTING MEANS
812
PACKET STORAGE MEANS
843
844
INTERVAL CALCULATION MEANS
845
PACKET OUTPUT MEANS
TRANSMITTING SIDE RELAY DEVICE 810
RELAY NETWORK
RECEIVING SIDE RELAY DEVICE 820
821
DISASSEMBLY MEANS
823
OUTPUT MEANS
822
REPRODUCTION MEANS
SECOND NETWORK

FIG. 49

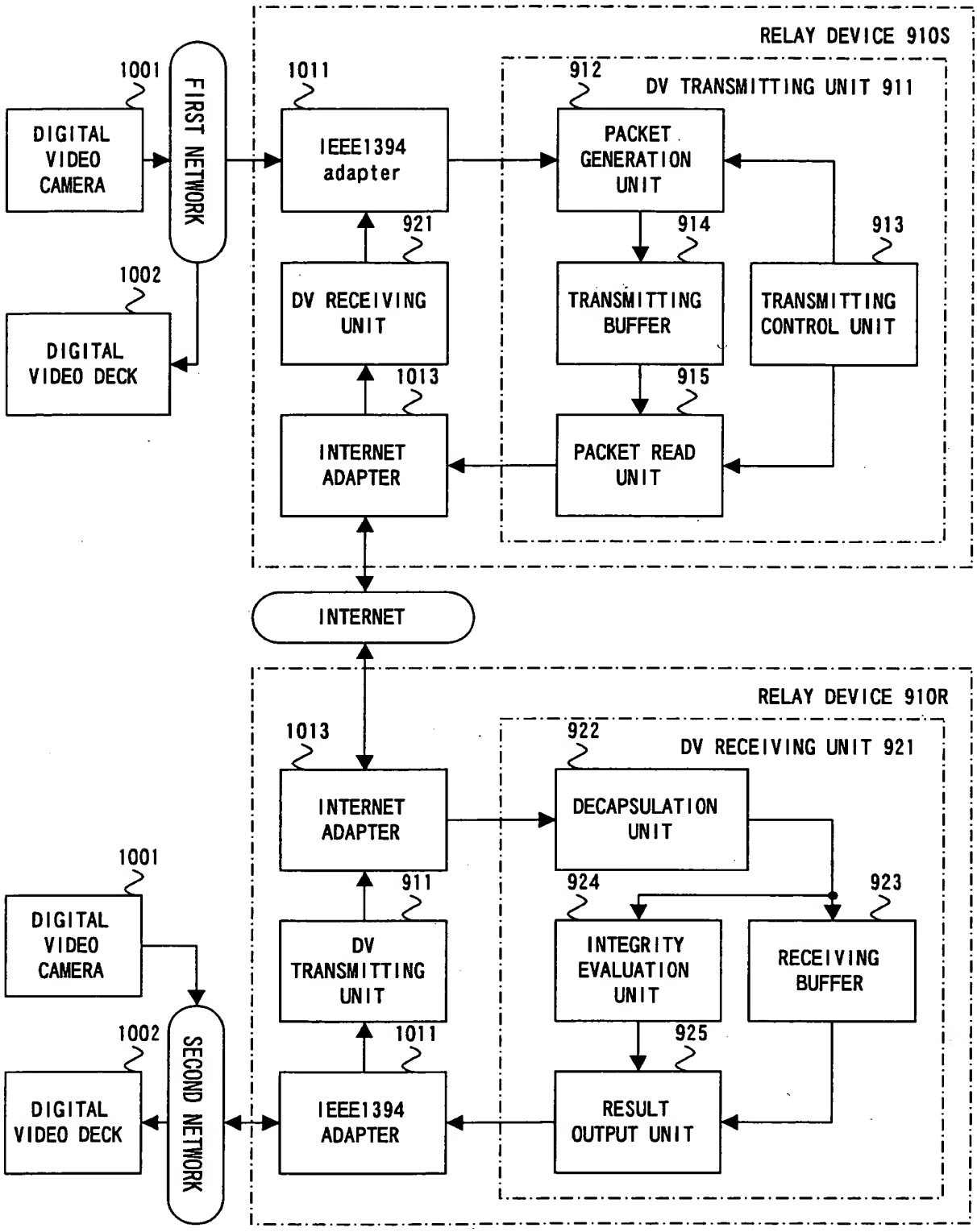

RELAY DEVICE 910S
1001
DIGITAL VIDEO CAMERA
FIRST NETWORK
1002
DIGITAL VIDEO DECK
1011
IEEE1394 adapter
912
DV TRANSMITTING UNIT 911
PACKET GENERATION UNIT
921
DV RECEIVING UNIT
914
TRANSMITTING BUFFER
913
TRANSMITTING CONTROL UNIT
1013
INTERNET ADAPTER
915
PACKET READ UNIT
INTERNET
RELAY DEVICE 910R
1013
INTERNET ADAPTER
922
DV RECEIVING UNIT 921
DECAPSULATION UNIT
1001
DIGITAL VIDEO CAMERA
911
DV TRANSMITTING UNIT
924
INTEGRITY EVALUATION UNIT
923
RECEIVING BUFFER
1002
DIGITAL VIDEO DECK
SECOND NETWORK
1011
IEEE1394 ADAPTER
925
RESULT OUTPUT UNIT

FIG. 50

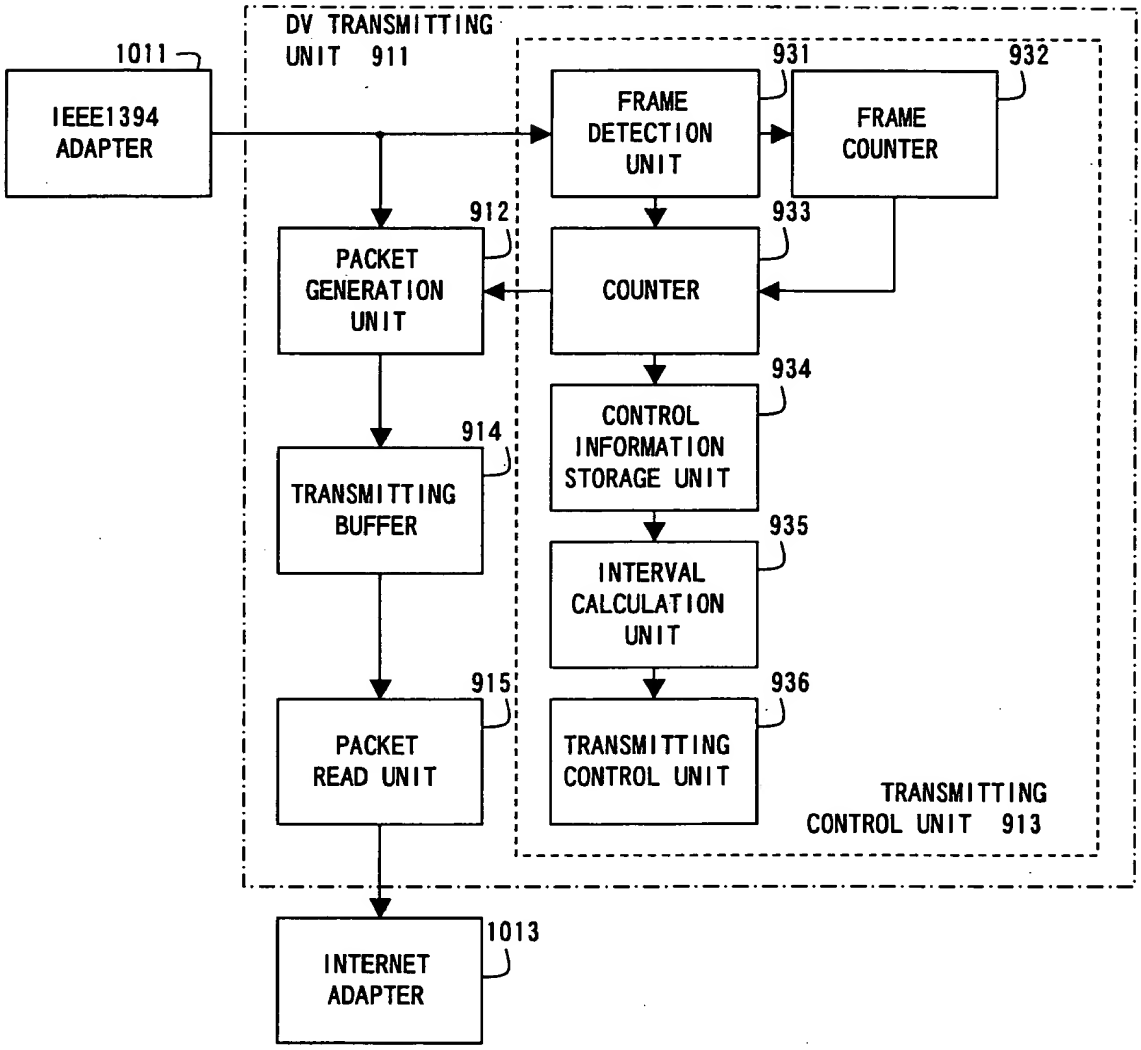

DV TRANSMITTING UNIT 911
1011
IEEE1394 ADAPTER
931
FRAME DETECTION UNIT
932
FRAME COUNTER
912
PACKET GENERATION UNIT
933
COUNTER
934
CONTROL INFORMATION STORAGE UNIT
914
TRANSMITTING BUFFER
935
INTERVAL CALCULATION UNIT
915
PACKET READ UNIT
936
TRANSMITTING CONTROL UNIT
TRANSMITTING CONTROL UNIT 913
1013
INTERNET ADAPTER

FIG. 51

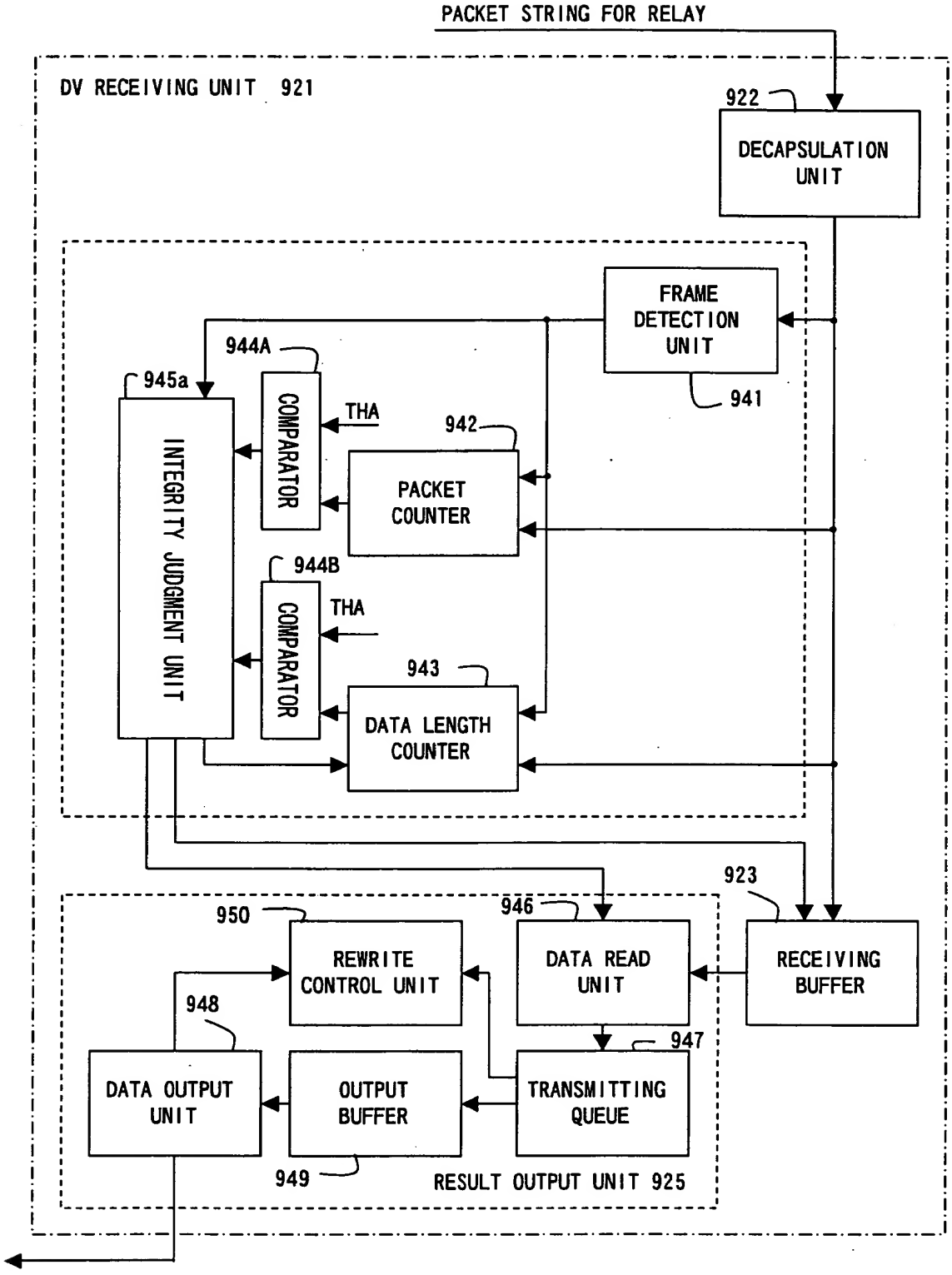
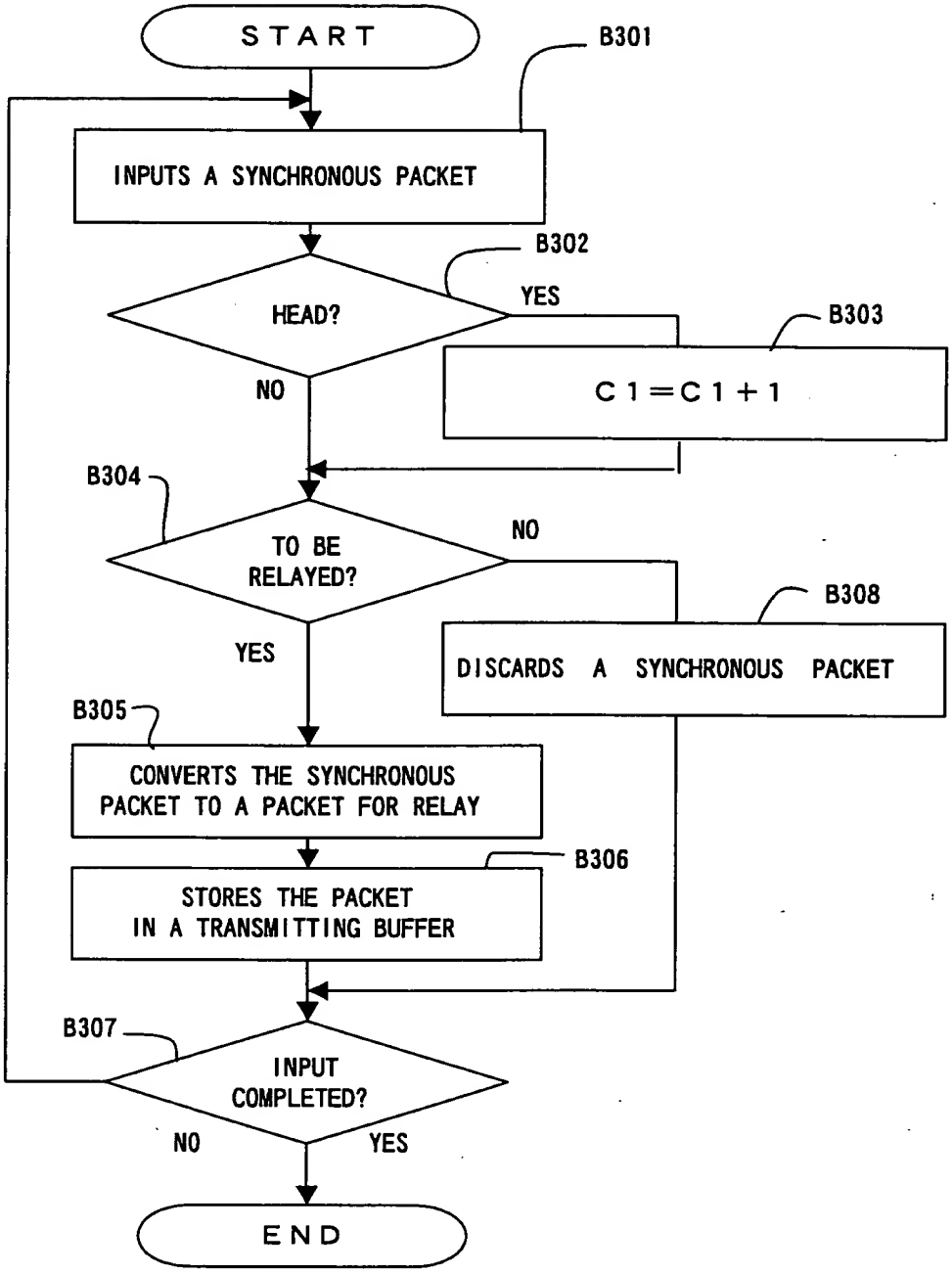

PACKET STRING FOR RELAY
DV RECEIVING UNIT 921
922
DECAPSULATION UNIT
FRAME DETECTION UNIT
941
944A
945a
COMPARATOR
THA
942
PACKET COUNTER
INTEGRITY JUDGMENT UNIT
944B
COMPARATOR
THA
943
DATA LENGTH COUNTER
923
950
946
REWRITE CONTROL UNIT
DATA READ UNIT
RECEIVING BUFFER
948
947
DATA OUTPUT UNIT
OUTPUT BUFFER
TRANSMITTING QUEUE
949
RESULT OUTPUT UNIT 925

FIG. 52


START
B301
INPUTS A SYNCHRONOUS PACKET
B302
HEAD?
YES
B303
C 1 = C 1 + 1
NO
B304
TO BE RELAYED?
NO
B308
DISCARDS A SYNCHRONOUS PACKET
YES
B305
CONVERTS THE SYNCHRONOUS PACKET TO A PACKET FOR RELAY
B306
STORES THE PACKET IN A TRANSMITTING BUFFER
B307
INPUT COMPLETED?
NO
YES
END

F I G. 5 3 A

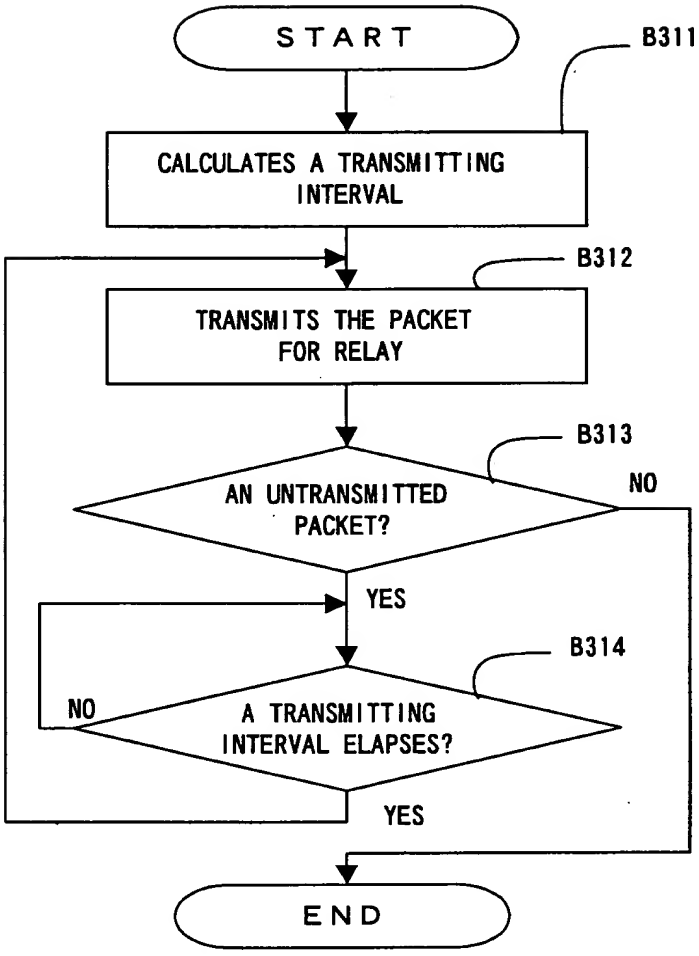

START
B311
CALCULATES A TRANSMITTING INTERVAL
B312
TRANSMITS THE PACKET FOR RELAY
B313
AN UNTRANSMITTED PACKET?
NO
YES
B314
NO
A TRANSMITTING INTERVAL ELAPSES?
YES
END

FIG. 53B

FIG. 54A

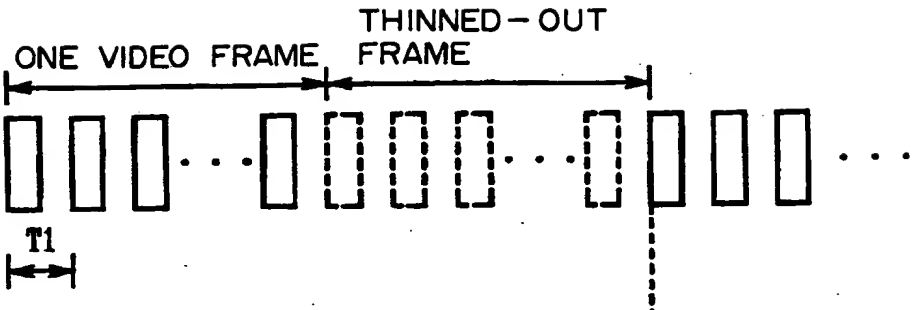
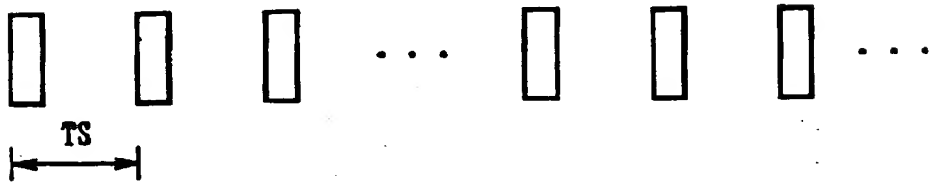


FIG. 54B



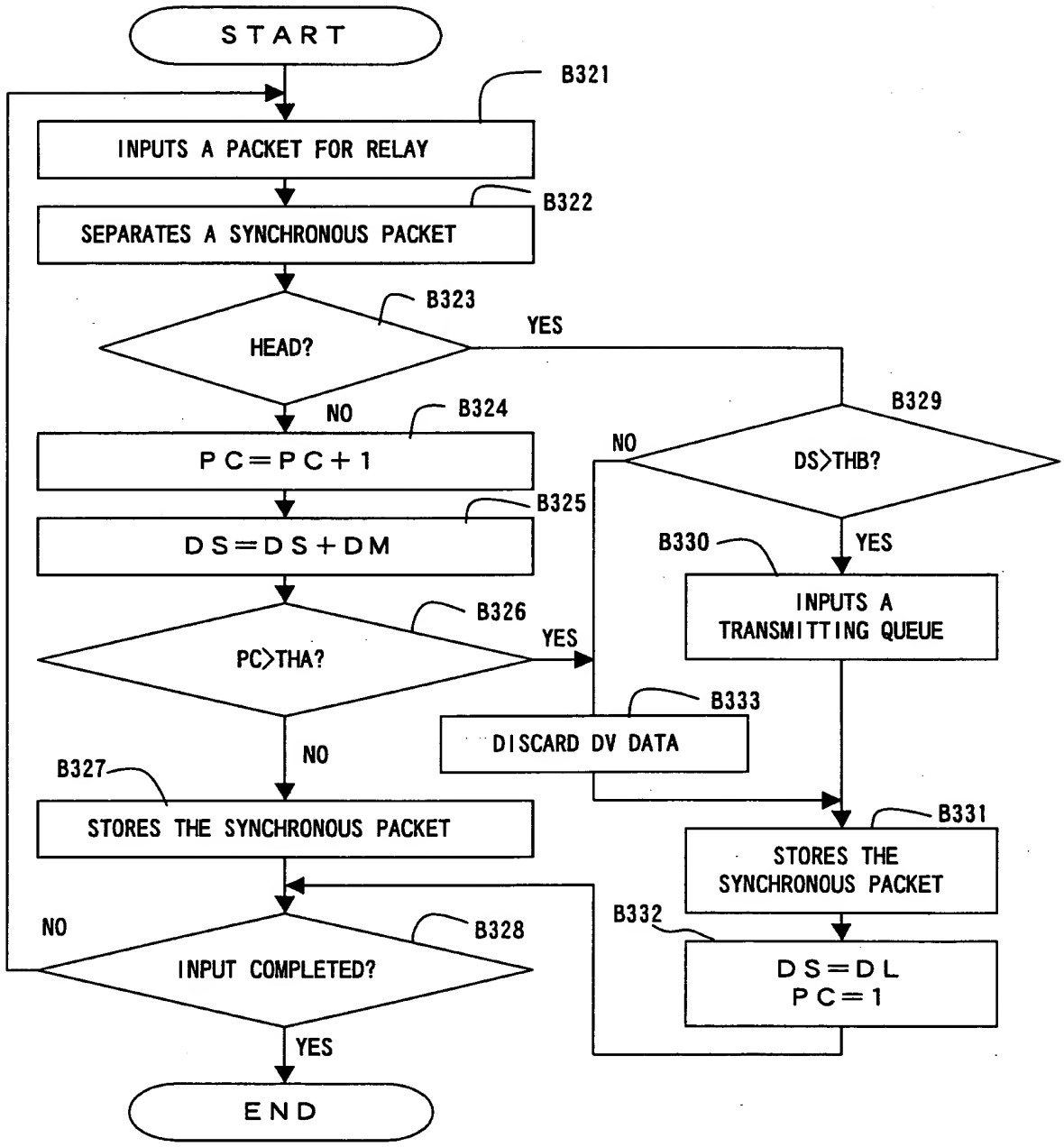

START
B321
INPUTS A PACKET FOR RELAY
B322
SEPARATES A SYNCHRONOUS PACKET
B323
HEAD?
YES
NO
B324
PC=PC+1
B325
DS=DS+DM
B326
PC>THA?
YES
NO
B327
STORES THE SYNCHRONOUS PACKET
B328
NO
INPUT COMPLETED?
YES
END
B329
NO
DS>THB?
B330
YES
INPUTS A TRANSMITTING QUEUE
B333
DISCARD DV DATA
B331
STORES THE SYNCHRONOUS PACKET
B332
DS=DL
PC=1

FIG. 55

FIG. 56A

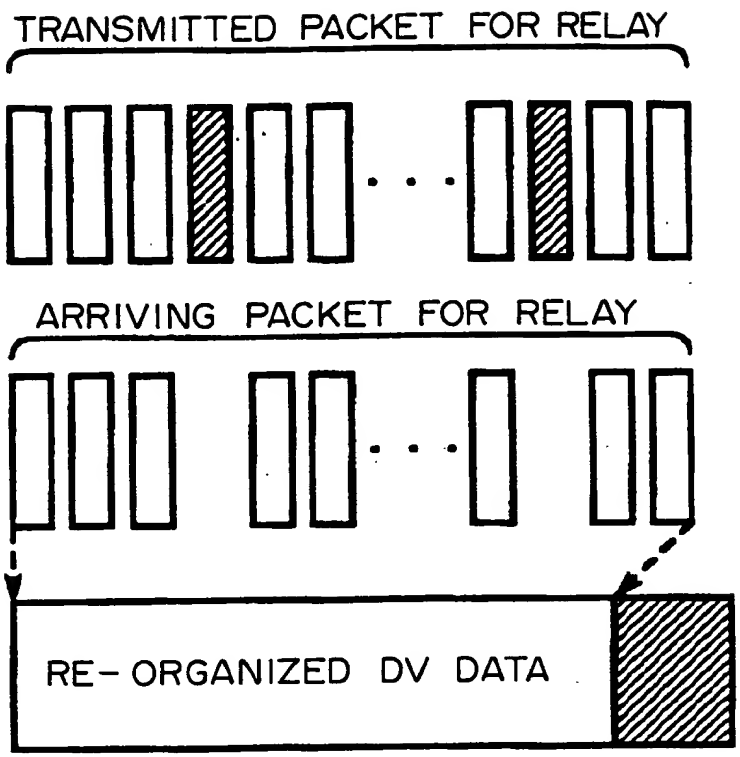
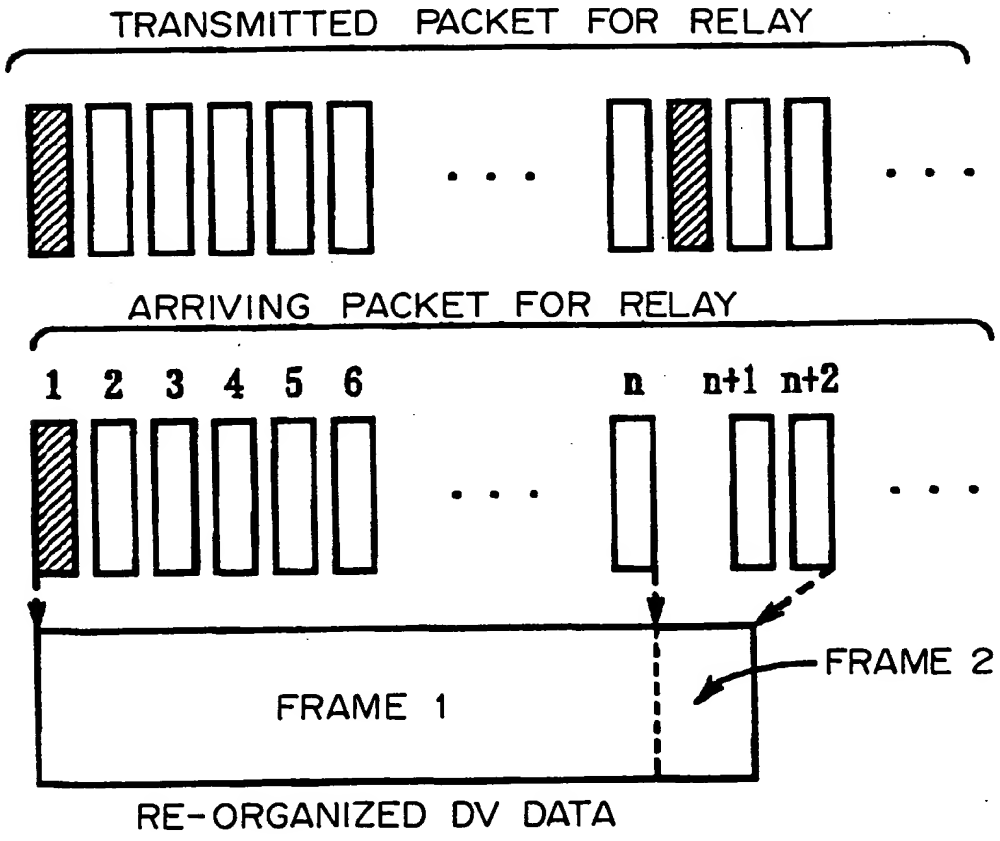


FIG. 56B



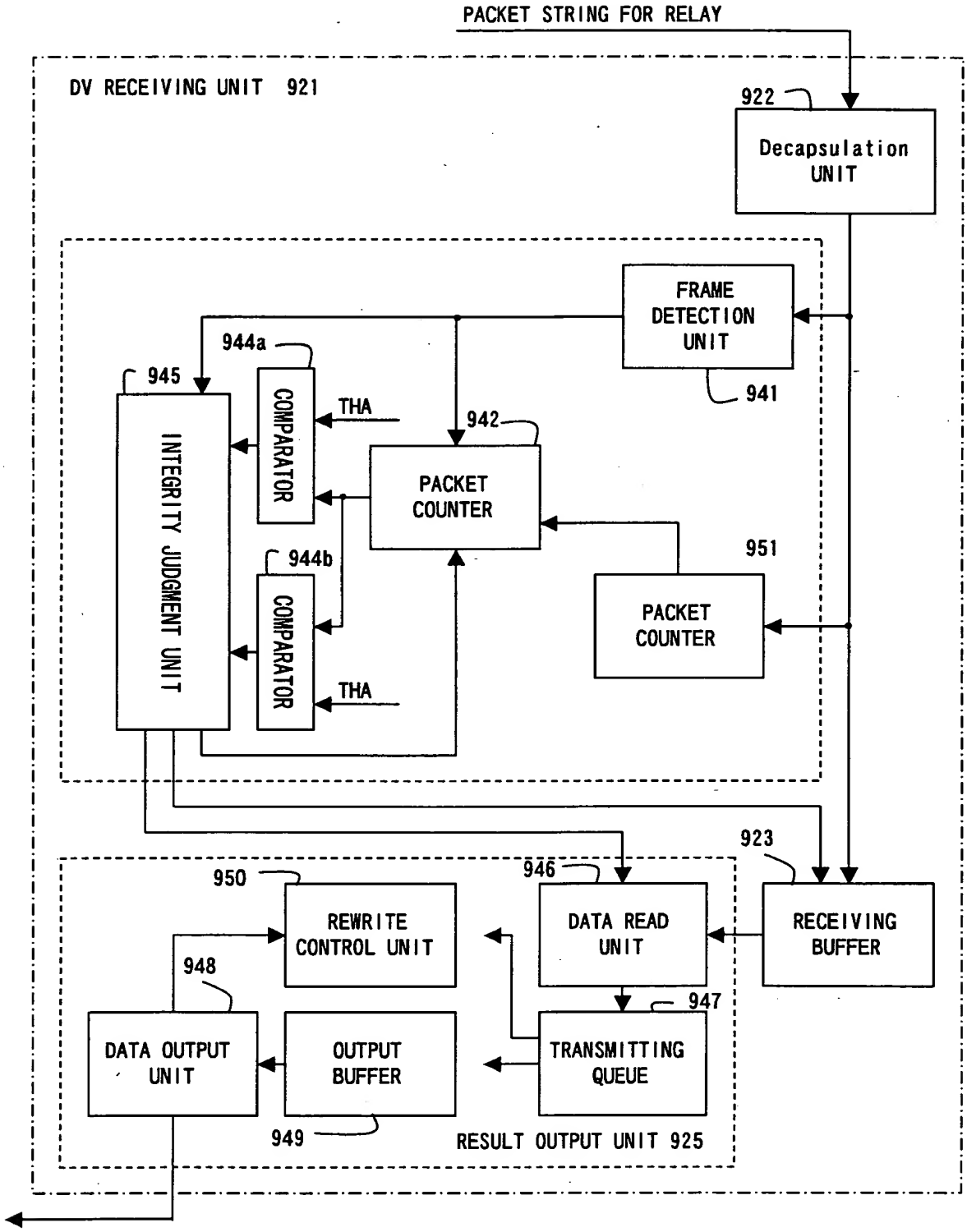

PACKET STRING FOR RELAY
DV RECEIVING UNIT 921
922
Decapsulation UNIT
FRAME DETECTION UNIT
941
944a
945
COMPARATOR
THA
942
INTEGRITY JUDGMENT UNIT
PACKET COUNTER
944b
951
COMPARATOR
PACKET COUNTER
THA
923
950
946
REWRITE CONTROL UNIT
DATA READ UNIT
RECEIVING BUFFER
948
947
DATA OUTPUT UNIT
OUTPUT BUFFER
TRANSMITTING QUEUE
949
RESULT OUTPUT UNIT 925

FIG. 57

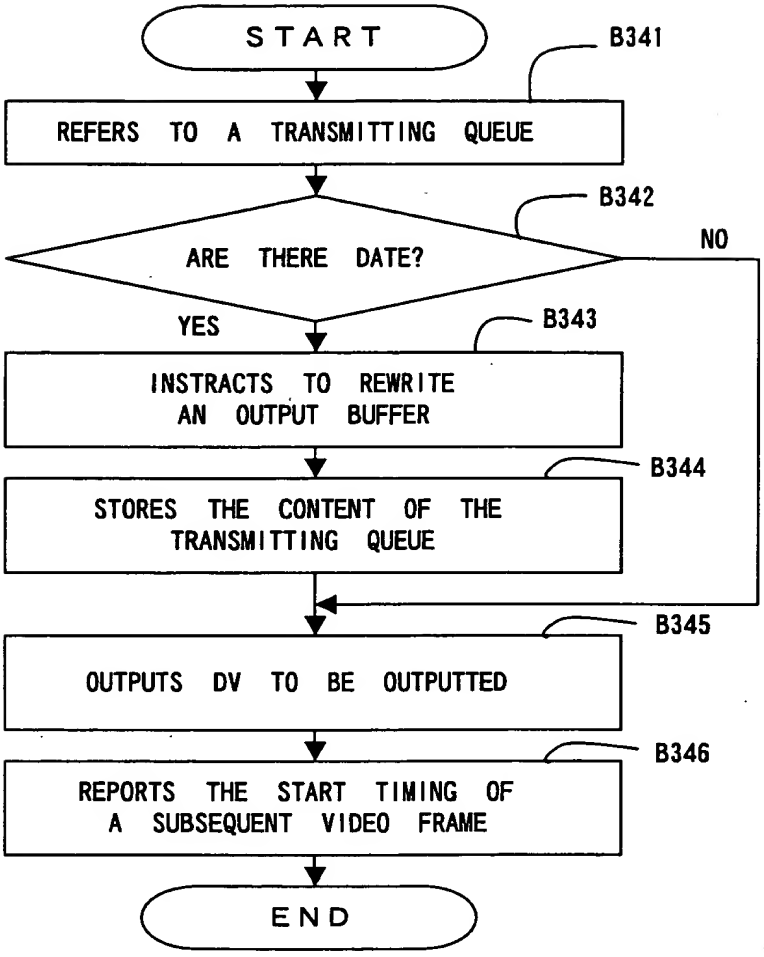

START
B341
REFERS TO A TRANSMITTING QUEUE
B342
ARE THERE DATE?
NO
YES
B343
INSTRACTS TO REWRITE AN OUTPUT BUFFER
B344
STORES THE CONTENT OF THE TRANSMITTING QUEUE
B345
OUTPUTS DV TO BE OUTPUTTED
B346
REPORTS THE START TIMING OF A SUBSEQUENT VIDEO FRAME
END

FIG. 58

FIG. 59A

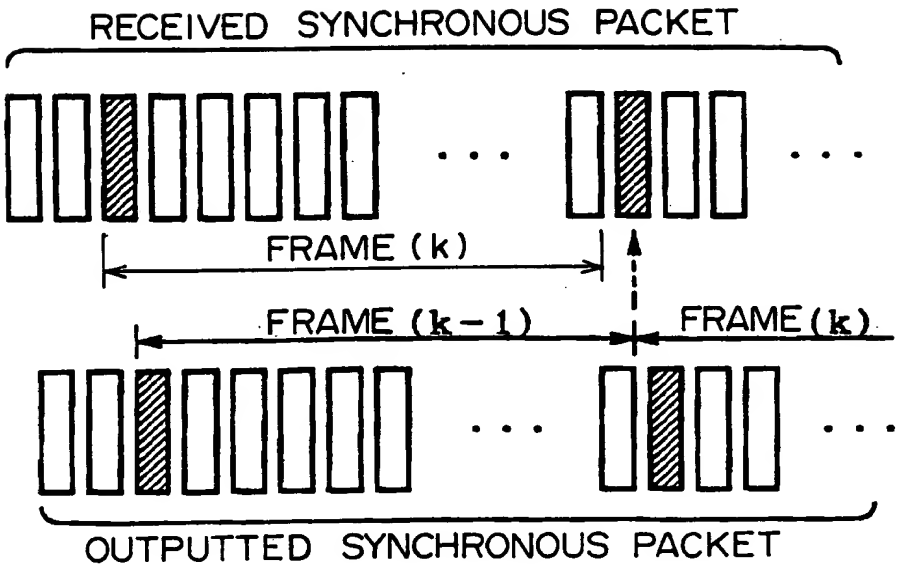
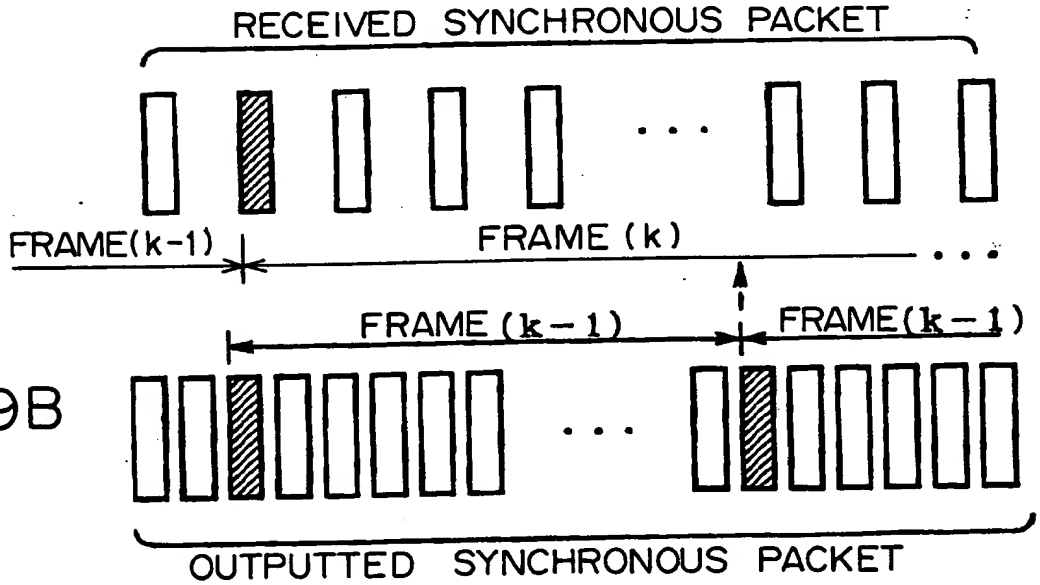


FIG. 59B



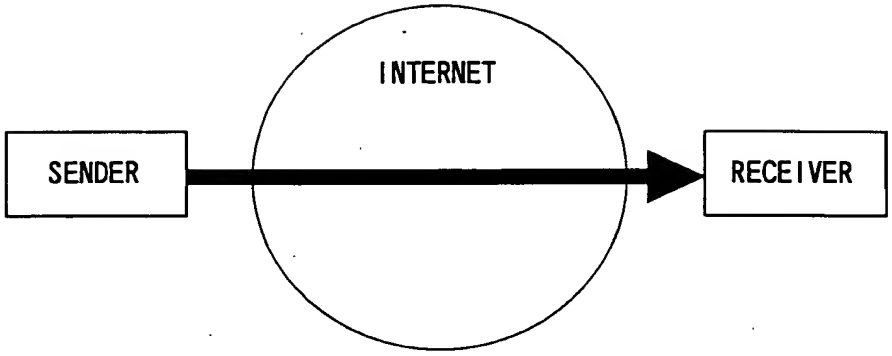


FIG. 60A

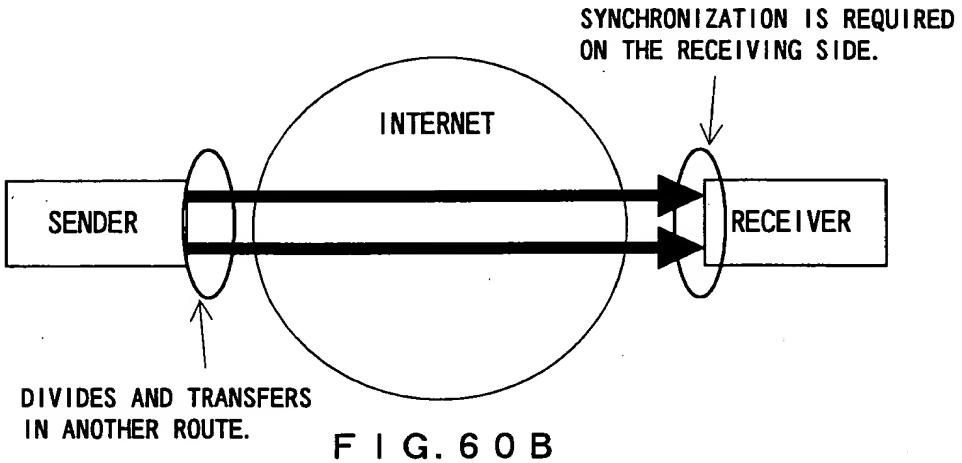


FIG. 60B

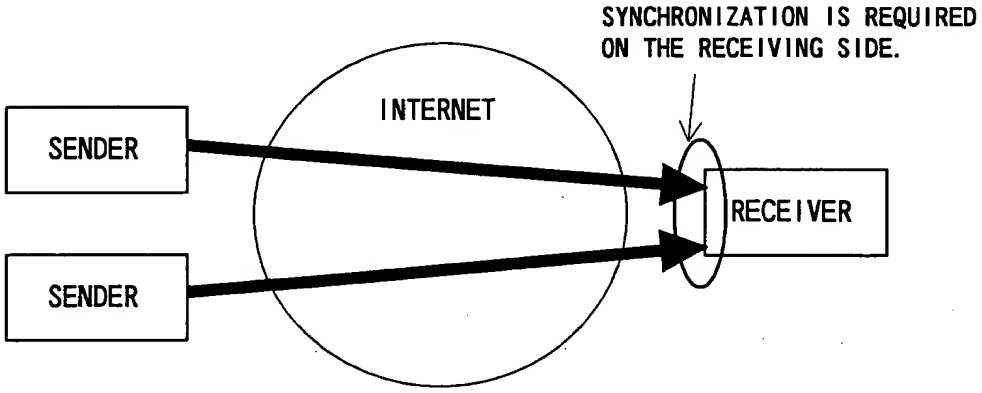


FIG. 60C

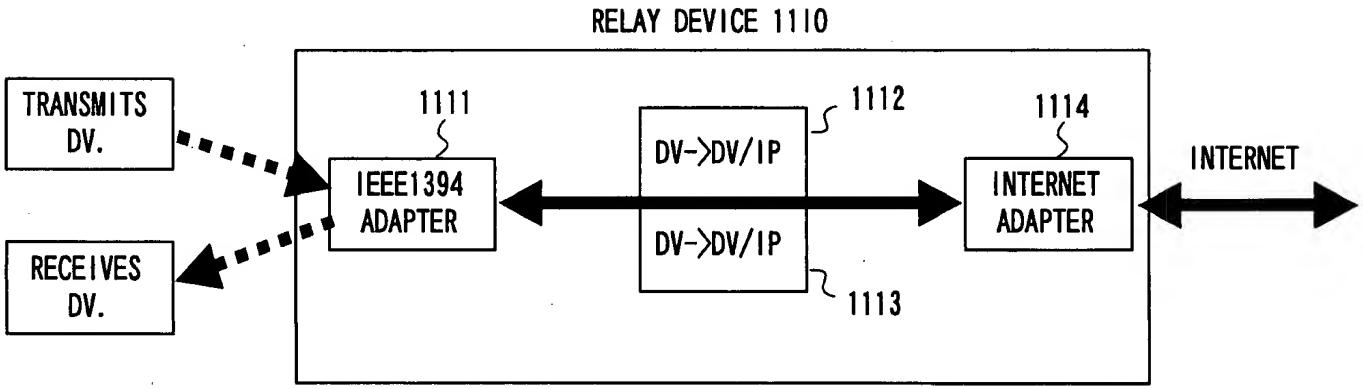

RELAY DEVICE 1110
TRANSMITS DV.
RECEIVES DV.
1111
IEEE1394 ADAPTER
1112
DV->DV/IP
DV->DV/IP
1113
1114
INTERNET ADAPTER
INTERNET

FIG. 61

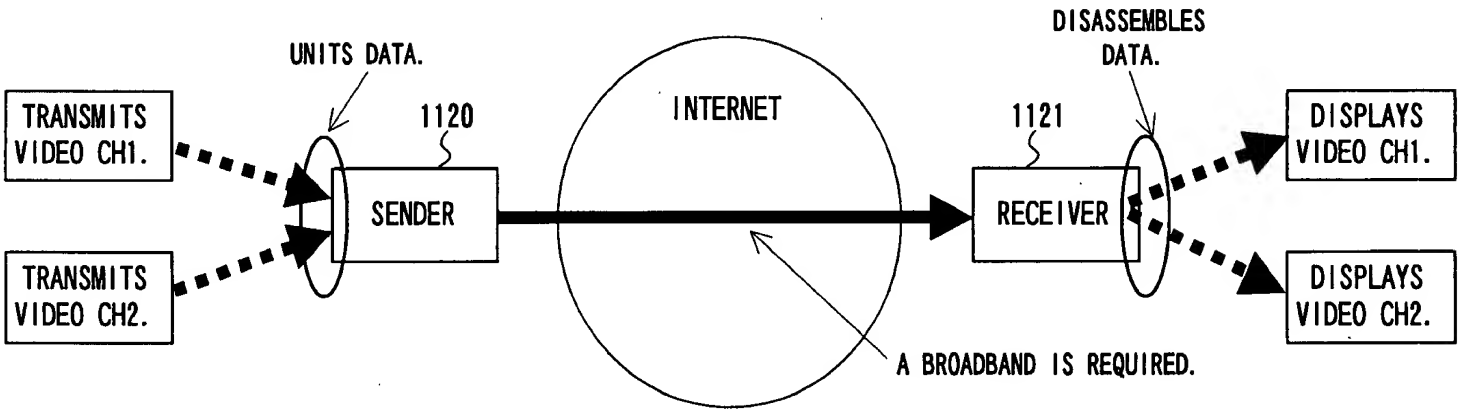

UNITS DATA.
1120
TRANSMITS VIDEO CH1.
TRANSMITS VIDEO CH2.
SENDER
INTERNET
A BROADBAND IS REQUIRED.
DISASSEMBLES DATA.
1121
RECEIVER
DISPLAYS VIDEO CH1.
DISPLAYS VIDEO CH2.

FIG. 62

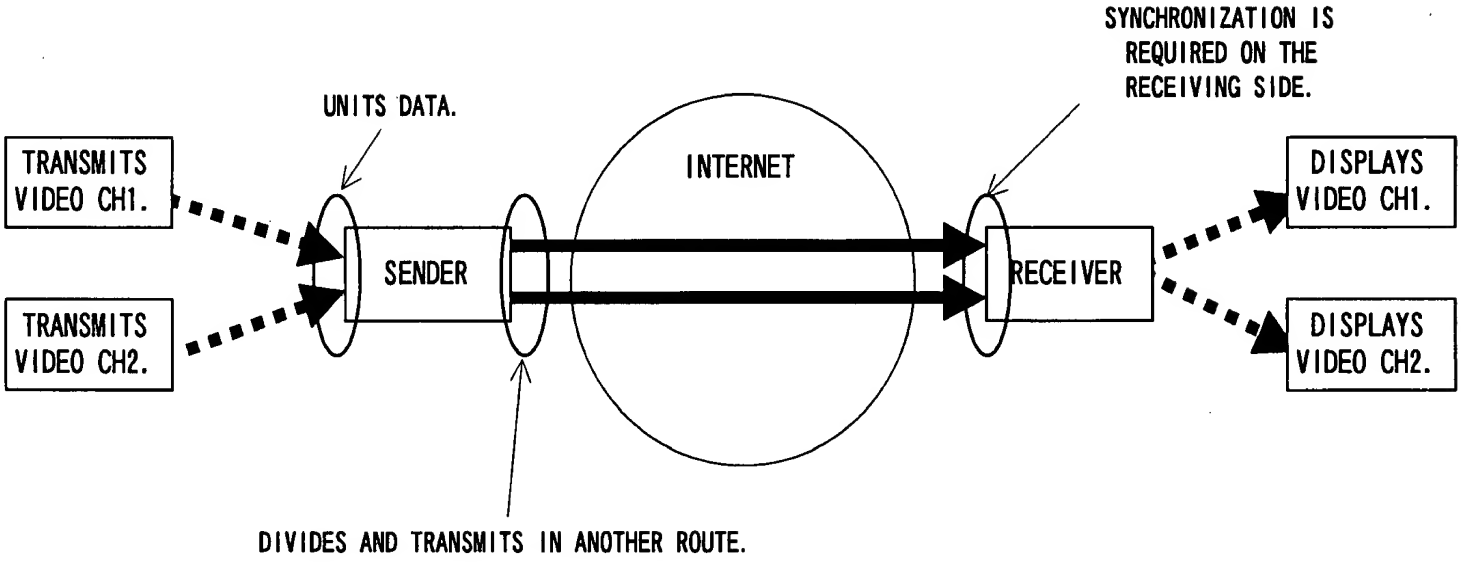

SYNCHRONIZATION IS
REQUIRED ON THE
RECEIVING SIDE.
UNITS DATA.
TRANSMITS
VIDEO CH1.
TRANSMITS
VIDEO CH2.
SENDER
INTERNET
RECEIVER
DISPLAYS
VIDEO CH1.
DISPLAYS
VIDEO CH2.
DIVIDES AND TRANSMITS IN ANOTHER ROUTE.

FIG. 63

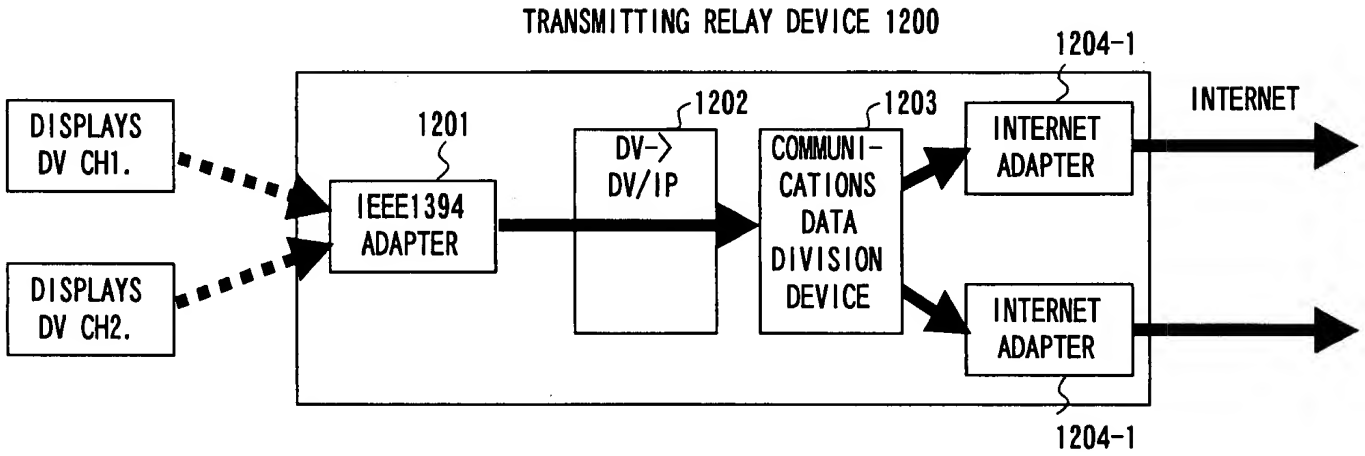

TRANSMITTING RELAY DEVICE 1200
DISPLAYS DV CH1.
DISPLAYS DV CH2.
1201
IEEE1394 ADAPTER
1202
DV-> DV/IP
1203
COMMUNI-CATIONS DATA DIVISION DEVICE
1204-1
INTERNET ADAPTER
INTERNET ADAPTER
1204-1
INTERNET

FIG. 64

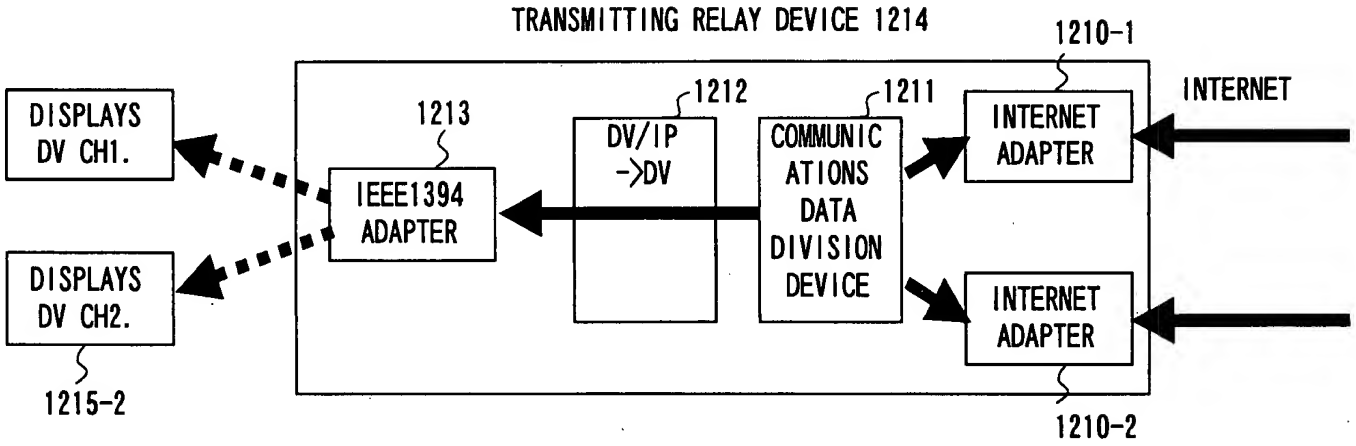

TRANSMITTING RELAY DEVICE 1214
1210-1
INTERNET
DISPLAYS DV CH1.
1213
IEEE1394 ADAPTER
1212
DV/IP ->DV
1211
COMMUNICATIONS DATA DIVISION DEVICE
INTERNET ADAPTER
INTERNET ADAPTER
DISPLAYS DV CH2.
1215-2
1210-2

FIG. 65

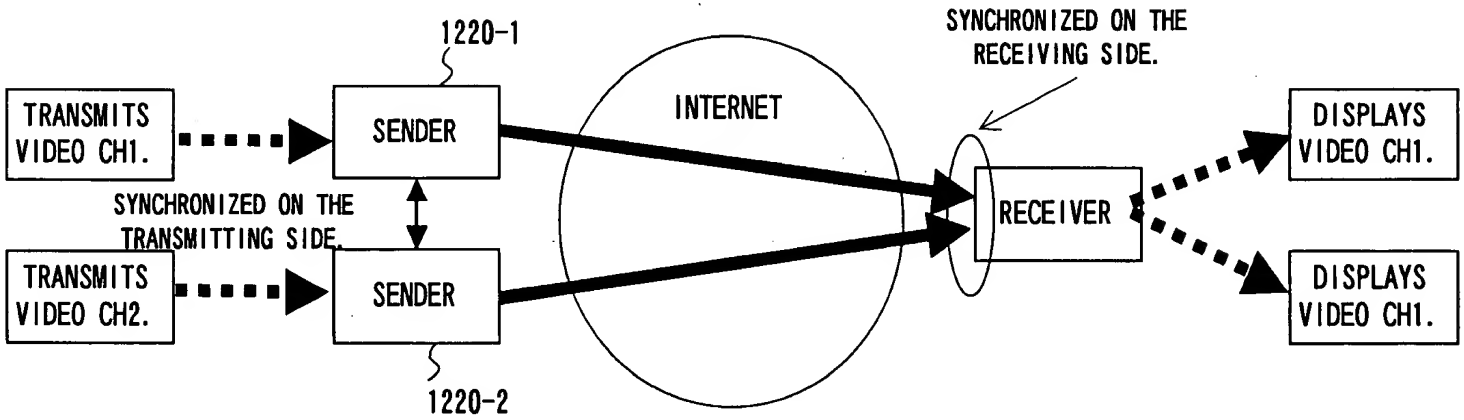
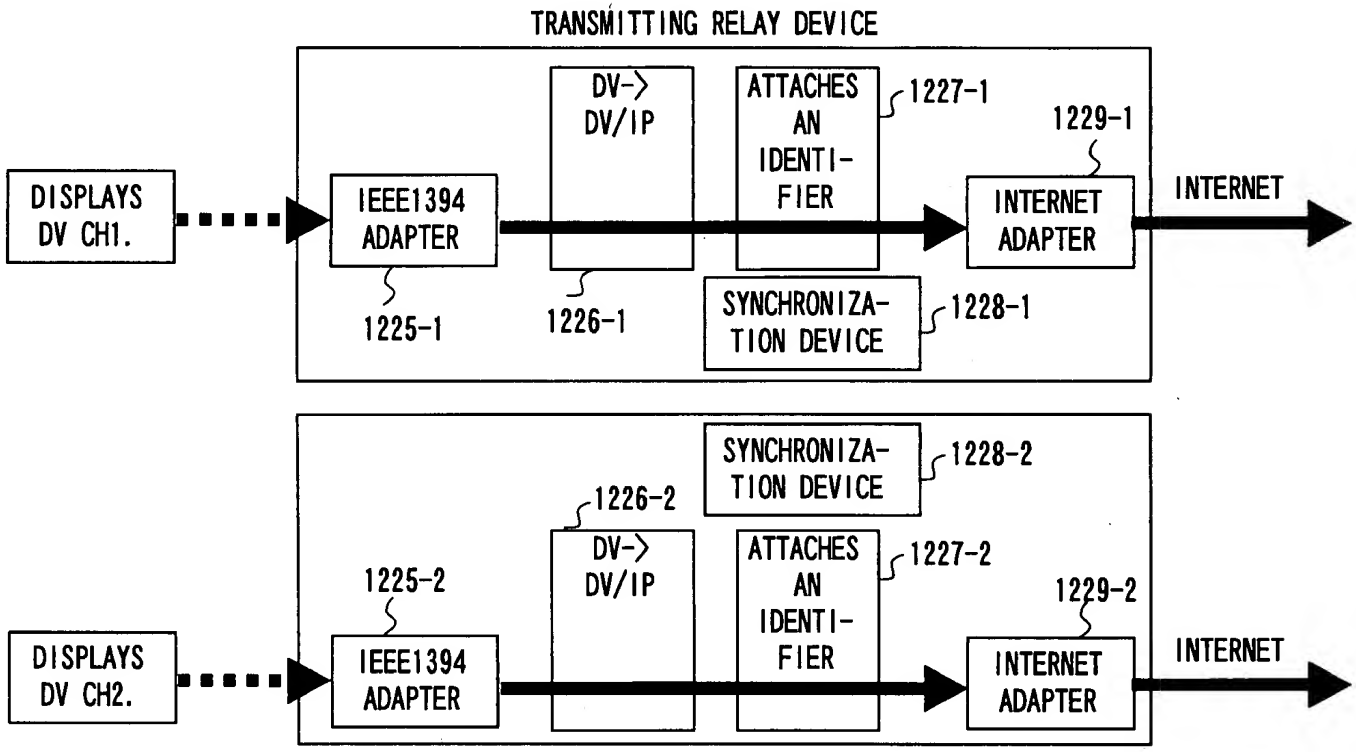

1220-1
SYNCHRONIZED ON THE RECEIVING SIDE.
TRANSMITS VIDEO CH1.
SENDER
INTERNET
DISPLAYS VIDEO CH1.
SYNCHRONIZED ON THE TRANSMITTING SIDE.
RECEIVER
TRANSMITS VIDEO CH2.
SENDER
DISPLAYS VIDEO CH1.
1220-2

FIG. 66


TRANSMITTING RELAY DEVICE
DISPLAYS DV CH1.
IEEE1394 ADAPTER
1225-1
DV-> DV/IP
1226-1
ATTACHES AN IDENTI-FIER
1227-1
SYNCHRONIZA-TION DEVICE
1228-1
1229-1
INTERNET ADAPTER
INTERNET
DISPLAYS DV CH2.
IEEE1394 ADAPTER
1225-2
DV-> DV/IP
1226-2
ATTACHES AN IDENTI-FIER
1227-2
SYNCHRONIZA-TION DEVICE
1228-2
1229-2
INTERNET ADAPTER
INTERNET

F I G. 6 7

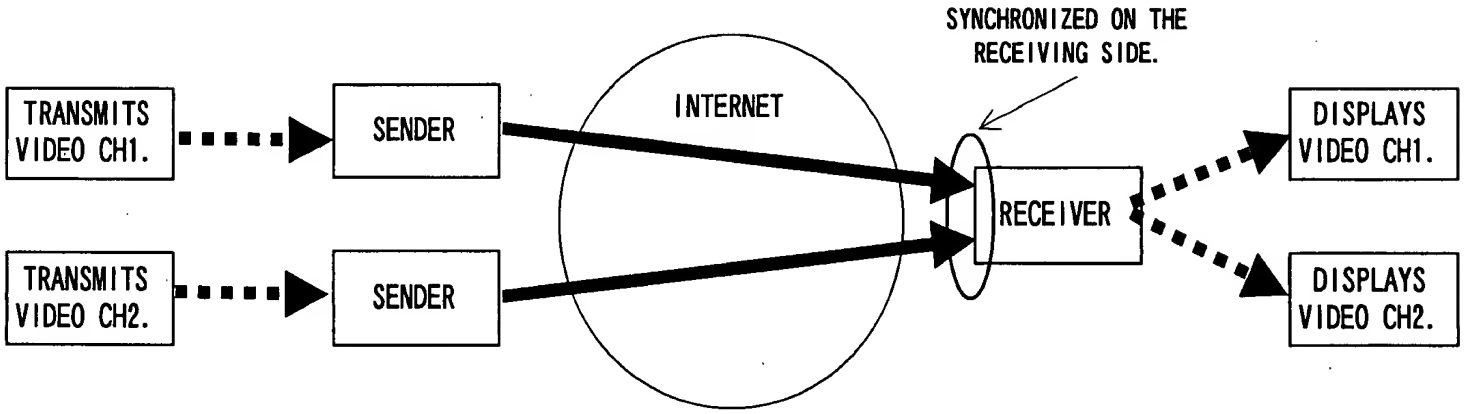

SYNCHRONIZED ON THE
RECEIVING SIDE.
TRANSMITS
VIDEO CH1.
SENDER
INTERNET
RECEIVER
DISPLAYS
VIDEO CH1.
TRANSMITS
VIDEO CH2.
SENDER
DISPLAYS
VIDEO CH2.

FIG. 68

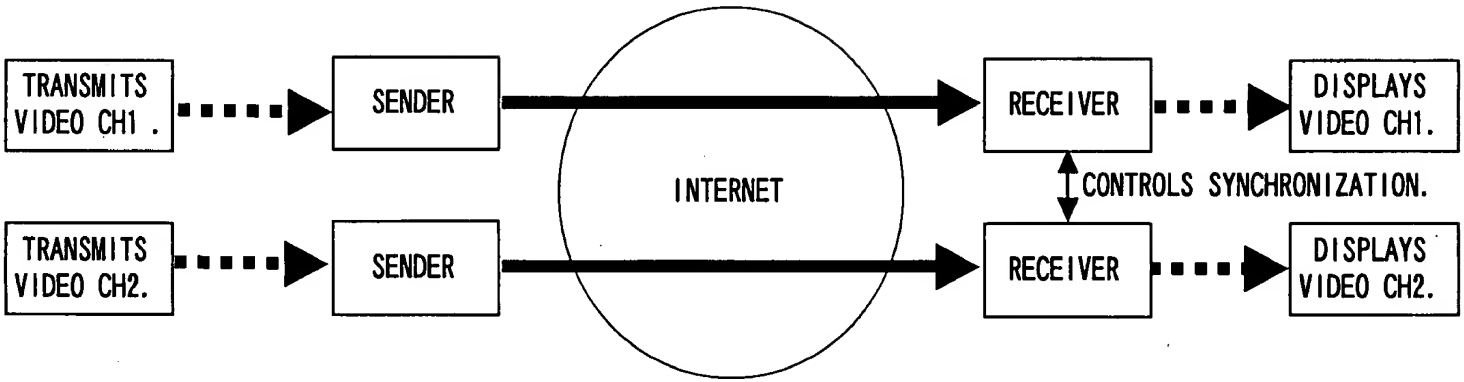

TRANSMITS VIDEO CH1 .
SENDER
INTERNET
RECEIVER
DISPLAYS VIDEO CH1.
CONTROLS SYNCHRONIZATION.
TRANSMITS VIDEO CH2.
SENDER
RECEIVER
DISPLAYS VIDEO CH2.

FIG. 69

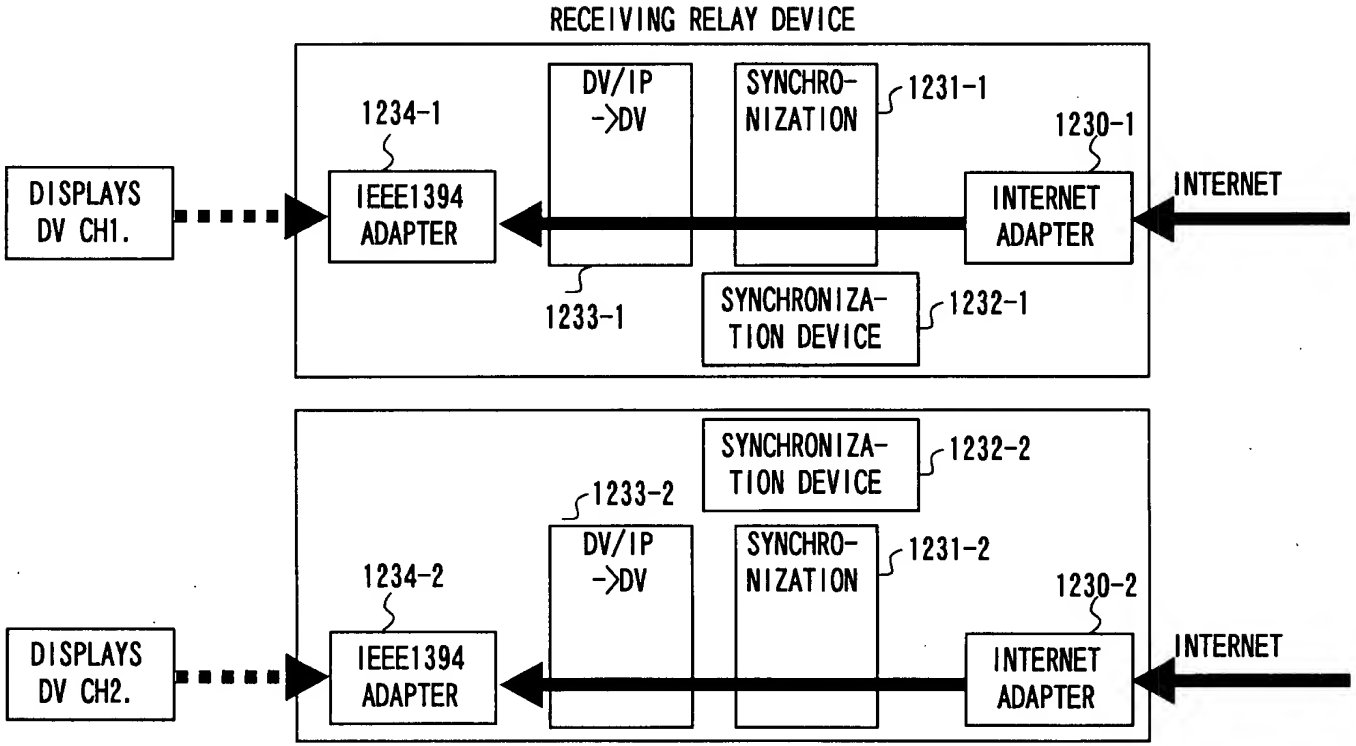

RECEIVING RELAY DEVICE
DISPLAYS DV CH1.
1234-1
IEEE1394 ADAPTER
DV/IP ->DV
1233-1
SYNCHRO-NIZATION
1231-1
1230-1
INTERNET ADAPTER
INTERNET
SYNCHRONIZA-TION DEVICE
1232-1
DISPLAYS DV CH2.
1234-2
IEEE1394 ADAPTER
1233-2
DV/IP ->DV
SYNCHRO-NIZATION
1231-2
1230-2
INTERNET ADAPTER
INTERNET
SYNCHRONIZA-TION DEVICE
1232-2

FIG. 70

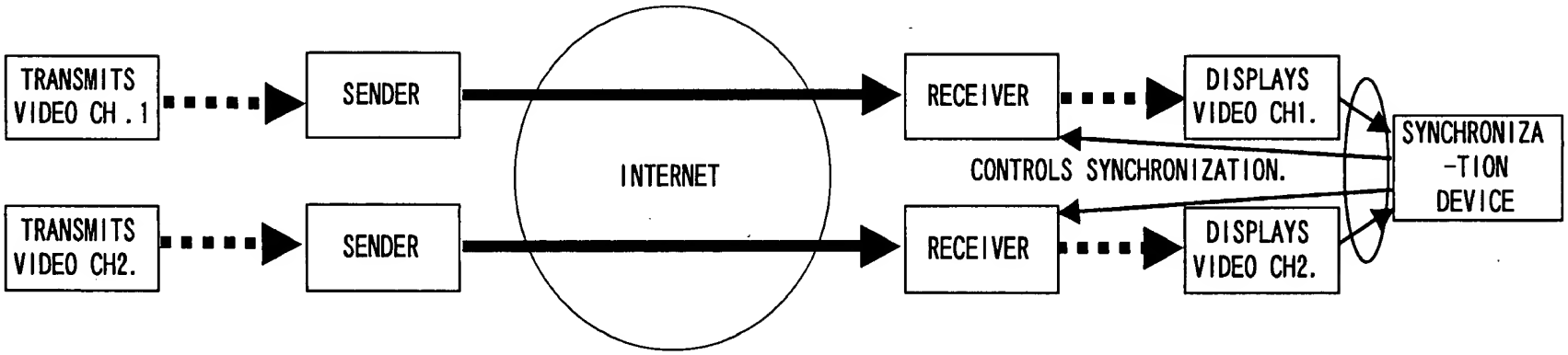

TRANSMITS VIDEO CH.1
SENDER
INTERNET
RECEIVER
DISPLAYS VIDEO CH1.
SYNCHRONIZA-TION DEVICE
CONTROLS SYNCHRONIZATION.
TRANSMITS VIDEO CH2.
SENDER
RECEIVER
DISPLAYS VIDEO CH2.

FIG. 71

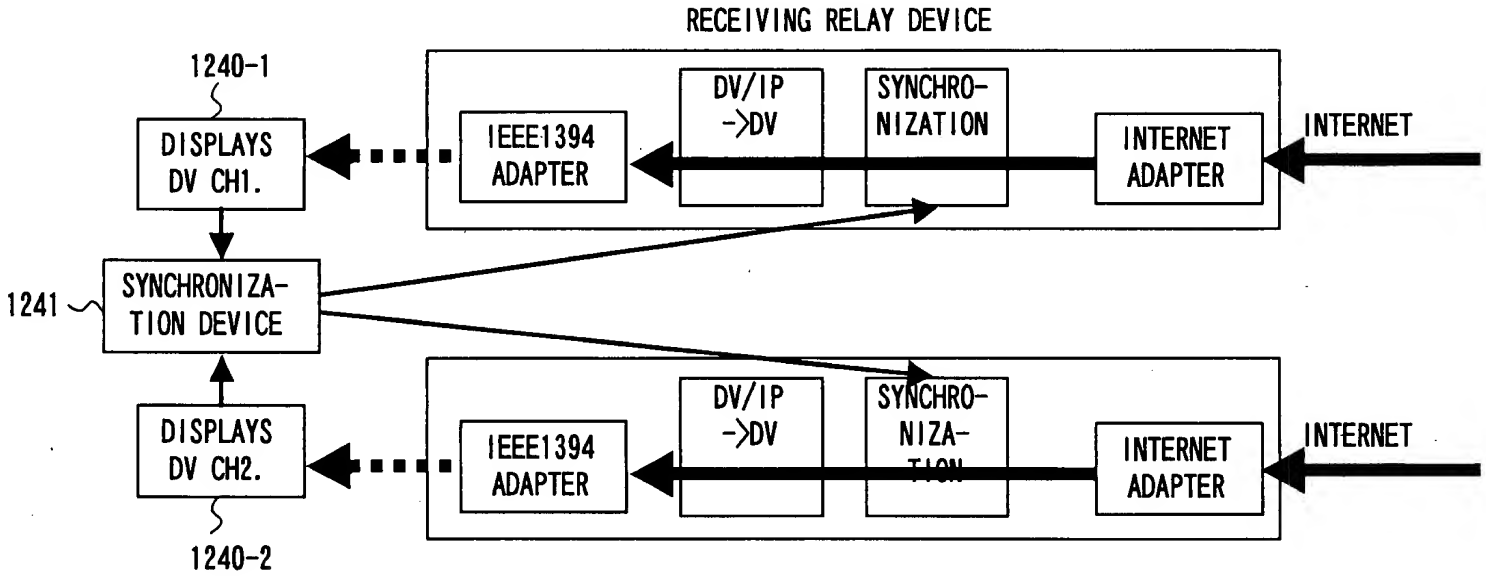

RECEIVING RELAY DEVICE
1240-1
DISPLAYS DV CH1.
IEEE1394 ADAPTER
DV/IP ->DV
SYNCHRO-NIZATION
INTERNET ADAPTER
INTERNET
1241
SYNCHRONIZA-TION DEVICE
DISPLAYS DV CH2.
IEEE1394 ADAPTER
DV/IP ->DV
SYNCHRO-NIZA-TION
INTERNET ADAPTER
INTERNET
1240-2

FIG. 72

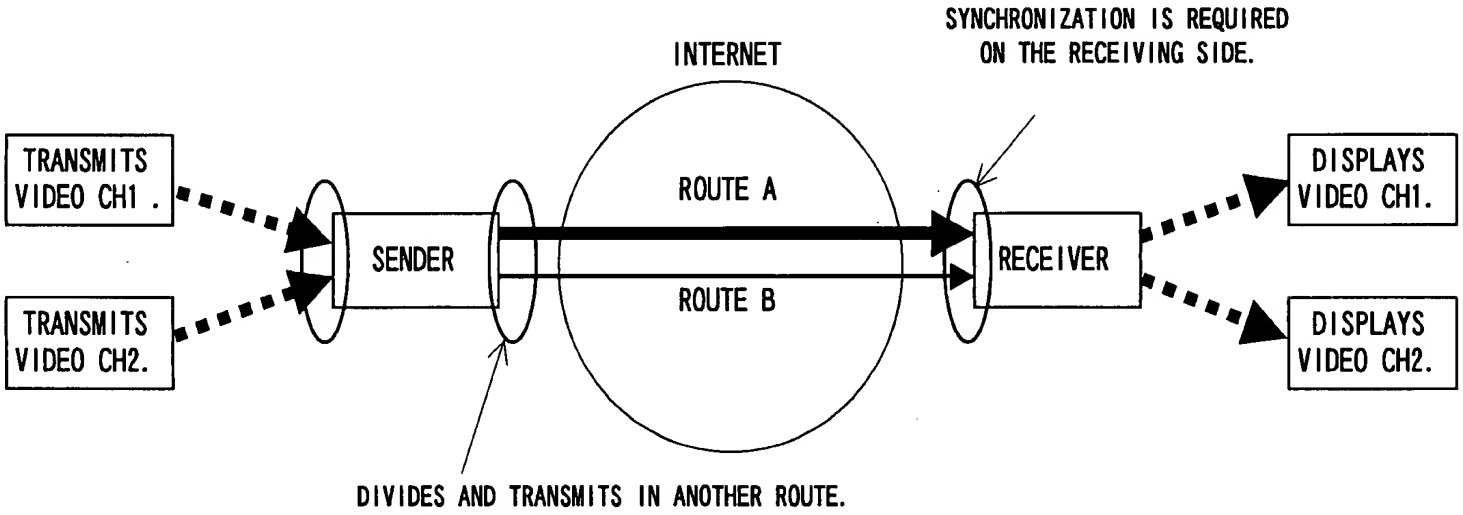

INTERNET
SYNCHRONIZATION IS REQUIRED
ON THE RECEIVING SIDE.
TRANSMITS
VIDEO CH1 .
TRANSMITS
VIDEO CH2.
SENDER
ROUTE A
ROUTE B
RECEIVER
DISPLAYS
VIDEO CH1.
DISPLAYS
VIDEO CH2.
DIVIDES AND TRANSMITS IN ANOTHER ROUTE.

FIG. 73

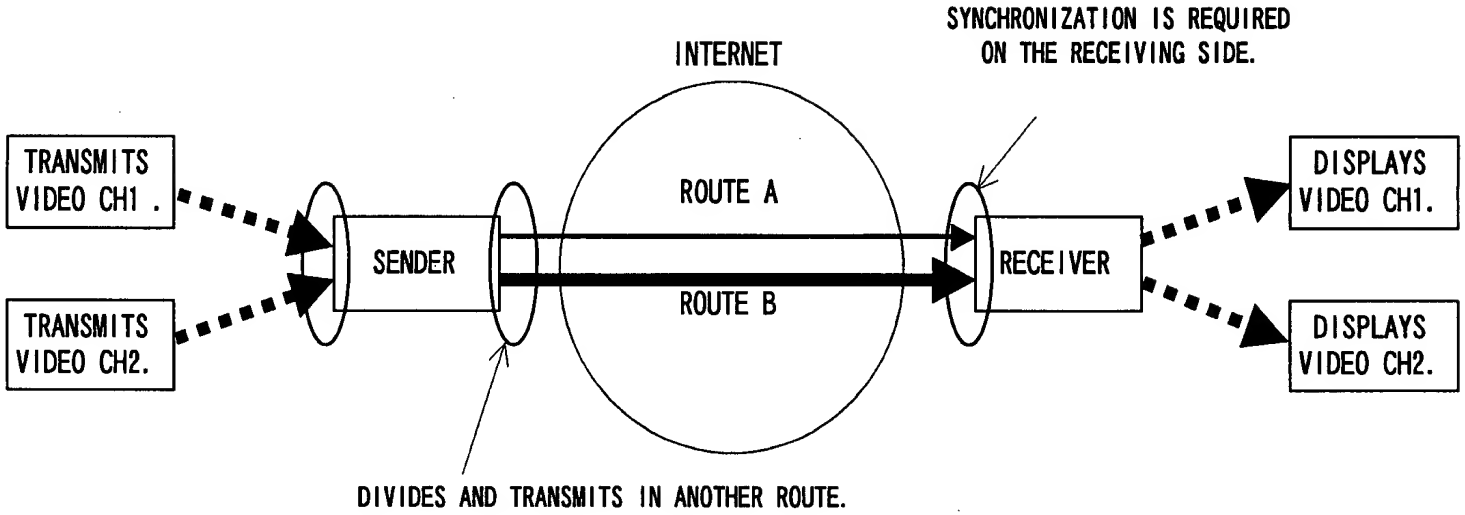

SYNCHRONIZATION IS REQUIRED
ON THE RECEIVING SIDE.
INTERNET
TRANSMITS
VIDEO CH1 .
TRANSMITS
VIDEO CH2.
SENDER
ROUTE A
ROUTE B
RECEIVER
DISPLAYS
VIDEO CH1.
DISPLAYS
VIDEO CH2.
DIVIDES AND TRANSMITS IN ANOTHER ROUTE.

FIG. 74

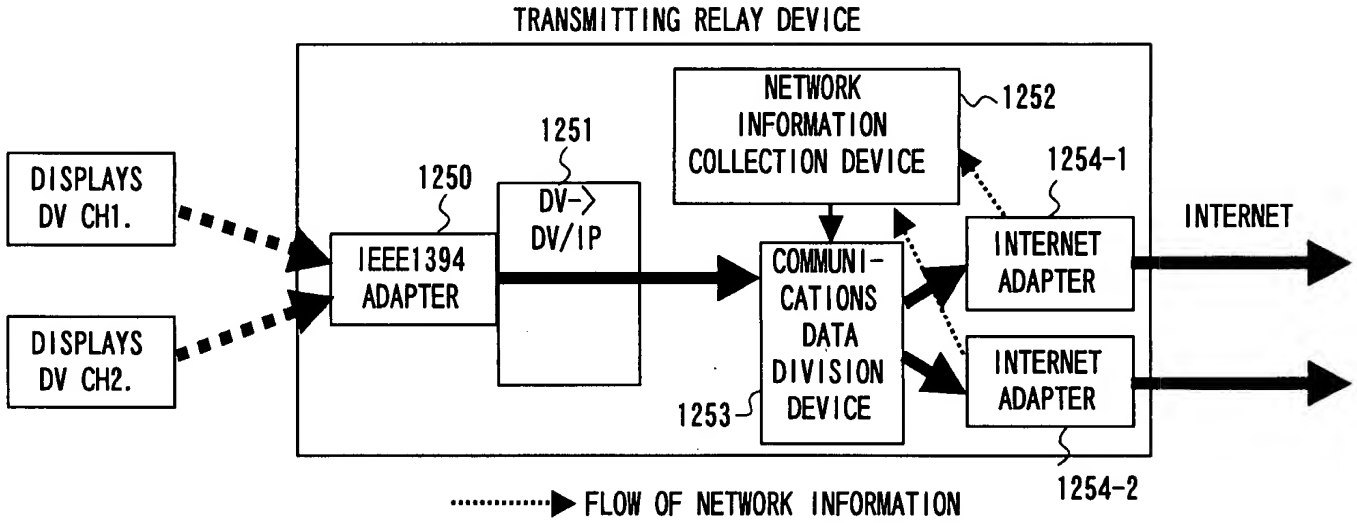

TRANSMITTING RELAY DEVICE
DISPLAYS DV CH1.
DISPLAYS DV CH2.
IEEE1394 ADAPTER
1250
DV-> DV/IP
1251
NETWORK INFORMATION COLLECTION DEVICE
1252
COMMUNI-CATIONS DATA DIVISION DEVICE
1253
INTERNET ADAPTER
1254-1
INTERNET ADAPTER
1254-2
INTERNET
FLOW OF NETWORK INFORMATION

FIG. 75

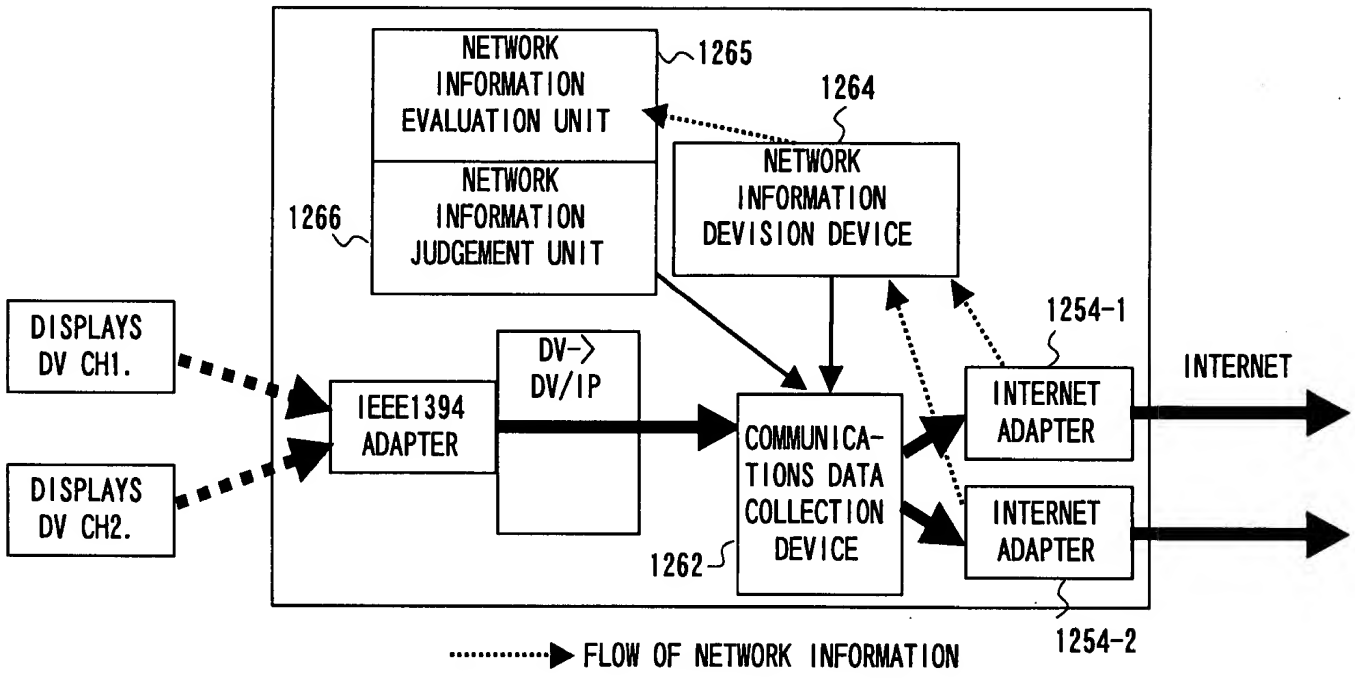

NETWORK INFORMATION EVALUATION UNIT
1265
1264
NETWORK INFORMATION DEVISION DEVICE
1266
NETWORK INFORMATION JUDGEMENT UNIT
1254-1
DISPLAYS DV CH1.
DISPLAYS DV CH2.
IEEE1394 ADAPTER
DV-> DV/IP
COMMUNICA-TIONS DATA COLLECTION DEVICE
INTERNET ADAPTER
INTERNET ADAPTER
INTERNET
1262
1254-2
FLOW OF NETWORK INFORMATION

FIG. 76

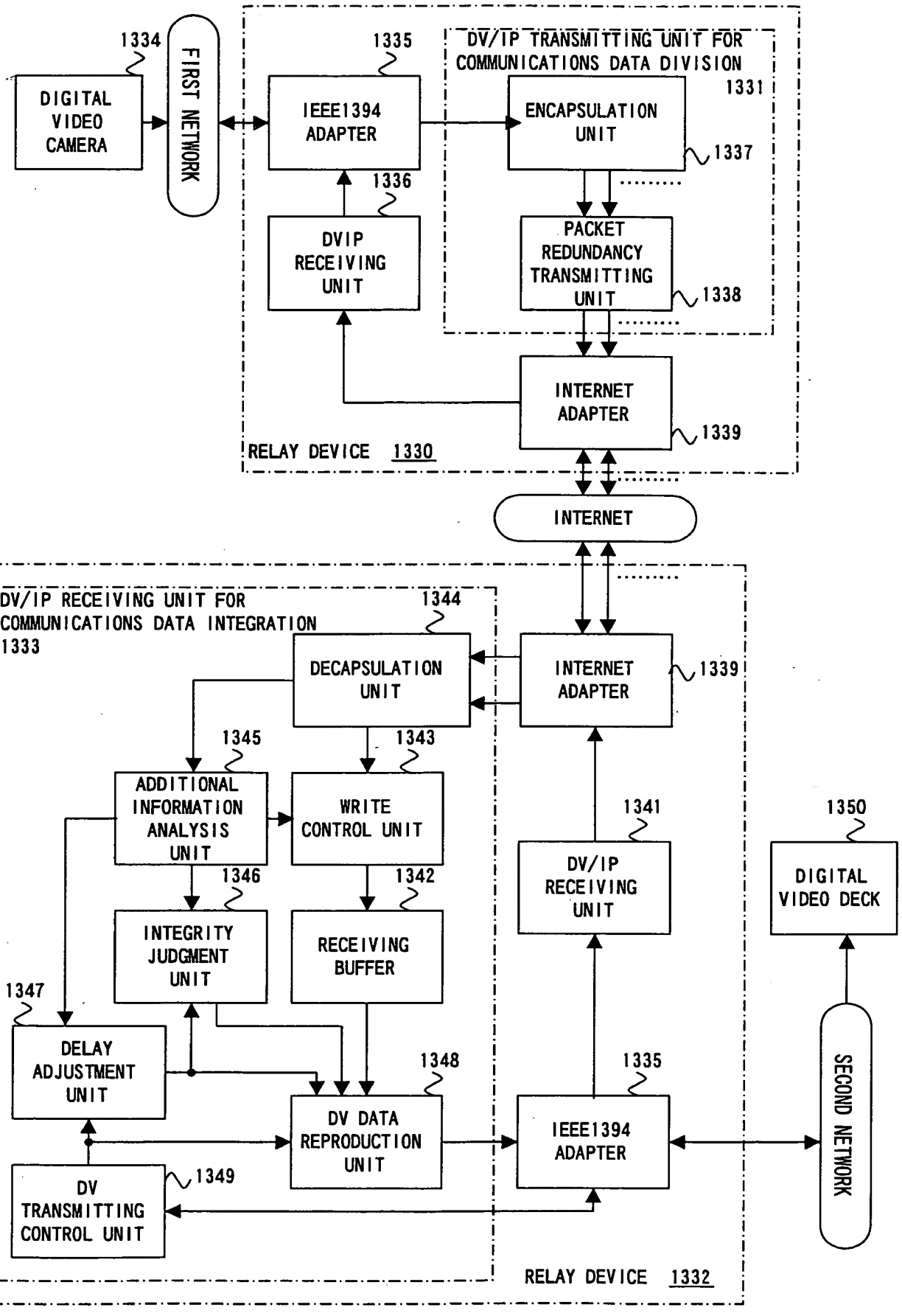

1334
DIGITAL VIDEO CAMERA
FIRST NETWORK
1335
IEEE1394 ADAPTER
DV/IP TRANSMITTING UNIT FOR COMMUNICATIONS DATA DIVISION
1331
ENCAPSULATION UNIT
1337
1336
DVIP RECEIVING UNIT
PACKET REDUNDANCY TRANSMITTING UNIT
1338
INTERNET ADAPTER
1339
RELAY DEVICE 1330
INTERNET
DV/IP RECEIVING UNIT FOR COMMUNICATIONS DATA INTEGRATION
1333
1344
DECAPSULATION UNIT
INTERNET ADAPTER
1339
1345
1343
ADDITIONAL INFORMATION ANALYSIS UNIT
WRITE CONTROL UNIT
1341
1350
1346
1342
DV/IP RECEIVING UNIT
DIGITAL VIDEO DECK
INTEGRITY JUDGMENT UNIT
RECEIVING BUFFER
1347
DELAY ADJUSTMENT UNIT
1348
1335
DV DATA REPRODUCTION UNIT
IEEE1394 ADAPTER
SECOND NETWORK
DV TRANSMITTING CONTROL UNIT
1349
RELAY DEVICE 1332

FIG. 77

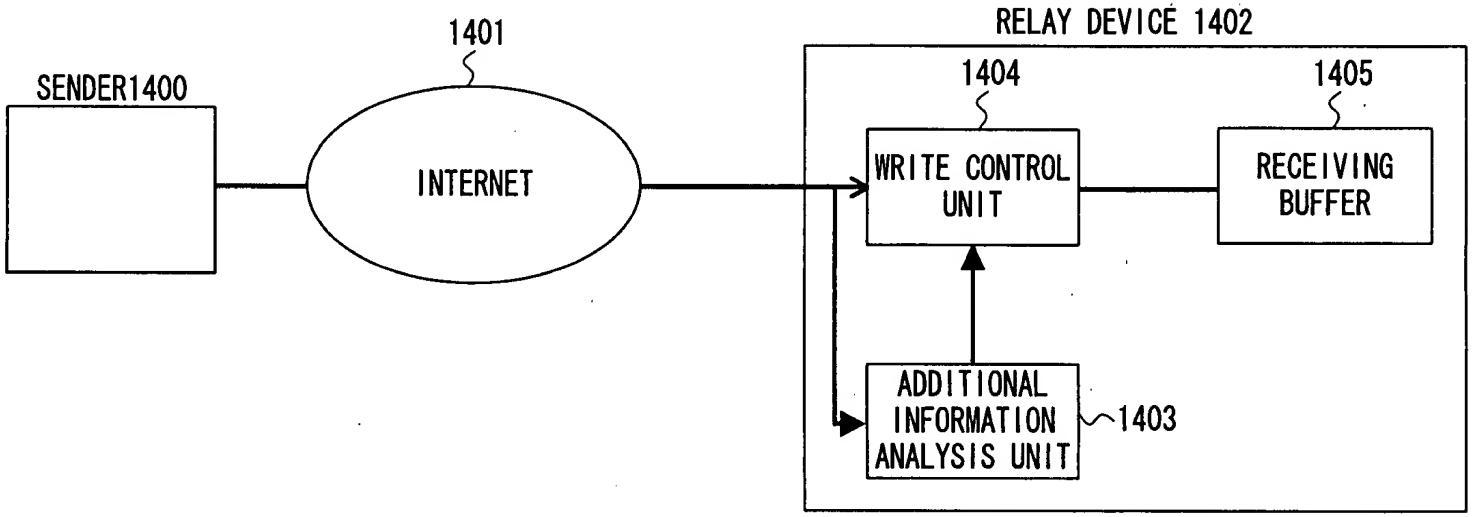

SENDER1400
1401
INTERNET
RELAY DEVICE 1402
1404
WRITE CONTROL UNIT
1405
RECEIVING BUFFER
ADDITIONAL INFORMATION ANALYSIS UNIT
1403

FIG. 78